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ABSTRACT

This booklet is designed to assist teachers in developing examinations for classroom use. It is a collection of 955 objective test questions, mostly multiple choice, for industrial arts students in the three areas of graphics technology, power technology, and production technology. Scoring keys are provided. There are no copyright restrictions, and the questions and accompanying figures are printed black on white to facilitate reproduction. It is recommended that items selected be related to actual course outlines. This collection of items is the third in a series of item collections for industrial arts subjects. (CTM)

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INDUSTRIAL ARTS

TEST DEVELOPMENT

BOOK III

U.S. DEPARTMENT OF HEALTH,
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RESOURCE ITEMS FOR

- *GRAPHICS TECHNOLOGY*
- *POWER TECHNOLOGY*
- *PRODUCTION TECHNOLOGY*

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BUREAU OF INDUSTRIAL ARTS EDUCATION
BUREAU OF ELEMENTARY AND SECONDARY EDUCATIONAL TEST DEVELOPMENT, ALBANY, NEW YORK 12234
1979

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FOREWORD

Industrial Arts - Test Development - Book III, is designed for use with Technology Series courses in Publications, Engineering Drawing, Construction, Manufacturing, Aerospace and Transportation. These electives are designed for the more able students and the questions reflect this orientation.

Book III was developed as a joint effort by the Bureau of Elementary and Secondary Educational Test Development and the Bureau of Industrial Arts Education. Kenneth D. Ormiston and Douglas Knox, Test Development; and Jarvis H. Baillargeon, Herbert M. Ranney and John W. Surra, Industrial Arts, were responsible for coordinating and editing this publication. Industrial Arts teachers who provided the items included: Herbert Batterman, Oxford; George Bedell, Averill Park; John Bond, Rush Henrietta; David Faux, State University College, Oswego; Charles Gierke, West Seneca; Erwin Howard, Gates Chili; Howard Kelem, Queens; Gerald Mallon, Westbury; David Mead, Brockport; Robert Silverman, Northport; Gerald Turner, Rush Henrietta; David Valentine, New Hartford.

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INDUSTRIAL ARTS - TEST DEVELOPMENT

Suggestions for Use

There are now four publications in the Industrial Arts - Test Development series:

- Test Development
  Drawing, Electricity, Power Mechanics, Woods
- Test Development - Book II
  Ceramics, Graphic Arts, Metals, Plastics
- Test Development - Book III
  Technology Series
- Safety Supplement No. 4
  Test items relating to safety practices

The series of Test Development publications is designed to assist Industrial Arts teachers in the development of quality examinations. The test items are categorized to provide a relationship with course content. A selection from these resources, combined with locally developed questions, would be the preferred approach. These publications are duplicated "black on white" to facilitate copying of selected items, using local graphic arts capability.

The questions included in the test development publications may be classified into three general topics:

> Recall questions which require only the ability to recall information, such as terminology, facts, classifications, and principles;
>
> Comprehension questions which require the ability to understand and interpret information;
>
> Application questions which require the ability to use previously learned information in the solution of new problems.

In preparing an examination, care should be taken to relate the items to actual content as outlined in the course of study. A review of the lessons identified in the daily class plan book should be the basis for selection. It also is a good practice to plan common core groups of test items if more than one teacher offers the same course in the district.

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Industrial Arts Examination Materials

GRAPHICS TECHNOLOGY

Directions (1-298): On your answer paper, write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Publications

Unit A Preparation (1-40)

1 A distance of thirty-six points in printer's measurement is equal to

(1) 1 in
(2) 1/2 in
(3) 1/3 in
(4) 1/4 in

2 The combined inside margins of a book are called the

1 spine
2 gutter
3 saddle
4 folio

3 Which lines are used on a layout if more than one color is to be printed on a sheet?

1 side guides
2 crop marks
3 register marks
4 gripper marks

4 The ratio of a 3-em space to a 3-em quad is

(1) 1 to 2
(2) 1 to 3
(3) 1 to 6
(4) 1 to 9

5 A writer's name at the head of a newspaper article is called a

1 banner
2 masthead
3 credit
4 by-line

6 Which type of job requires the use of the "pickup operation"?

1 binder
2 pressman
3 cameraman
4 platemaker

7 An illustration that runs off the printed page is called a

1 cut
2 runoff
3 carryover
4 bleed

8 How many 7" × 10" sheets may be cut from 1 sheet of 17" × 22" bond paper?

(1) 5
(2) 2
(3) 8
(4) 4

9 Which is a glossy coating over a printed sheet?

1 chrome coat
2 gloss top
3 varnish
4 protective coat

10 How much does 500 sheets of 25" × 38", sixty-pound offset paper weigh?

(1) 24 lb
(2) 30 lb
(3) 60 lb
(4) 120 lb

11 How far should a side guide jog a sheet of paper?

(1) 1/8 to 1/4 in
(2) 3/4 to 1 in
(3) 1 to 1 1/2 in
(4) 3 to 4 in

12 Which of the following is not a bindery operation?

1 gluing
2 cutting
3 stitching
4 stripping

13 Which type of device is usually used to draw layout lines?

1 repro pen
2 red pencil
3 ruling pen
4 blue pencil

14 Which of the following procedures aids in folding heavy paper or board against the grain?

1 perforating the sheet
2 dampening the sheet
3 scoring the sheet
4 heating the sheet

15 Advertising lines are usually measured in units called

1 inches	3 agate lines
2 picas	4 centimeters

16 Which is the result of combining equal amounts of two primary colors?

1 a secondary color	3 gray
2 a tertiary color	4 white

17 Placing numbers on the pages of a book is called

1 routing	3 indexing
2 numbering	4 folioing

18 What is the function of perforators during the procedure of folding large signatures that require many folds?

1 to make sharp edges	3 to make cutting easier
2 to let air escape	4 to mark the edges of the sheets

19 What does the symbol "AA" represent on a sheet of copy?

1 ask author	3 author's alterations
2 art accepted	4 all copy acceptable

20 A machine that makes paper from pulp or rag fiber is called a

1 Fourdrinier	3 LaFourtie
2 Senefelder	4 Gutenberg

21 A group of pages laid out on a single press sheet is called a

1 dummy	3 signature
2 flat	4 book

22 Paper can be cut into irregular shapes by a process known as

1 die-cutting	3 shaping
2 embossing	4 grounding

23 A layout which is set up to be photographed is called a

1 pasteup	3 mechanical
2 camera sheet	4 dummy

24 How many sheets of 20 1/2" × 24 3/4" index must be cut to yield 7,500 4" × 6" cards?

(1) 325	(3) 466
(2) 375	(4) 840

25 How many sheets of 17" × 22" bond paper must be cut to yield 64,000 5 1/2" × 8 1/2" billheads?

(1) 3,500	(3) 16,000
(2) 8,000	(4) 32,000

26 What are the marks which the preparation man places on the mechanical to show the confines of the printed sheet called?

1 register marks	3 gripper marks
2 crop marks	4 side marks

27 Which procedure is used to compensate for "creep" when laying out a large booklet to be saddle stitched?

1 Print larger borders.
2 Reduce gutters of inner signatures.
3 Trim wider than normal.
4 Make type measure narrower.

28 Reproduction proofs are used for

1 preparing roughs	3 camera copy
2 proofreading	4 estimating costs

29 The correct sequence of steps in the planning of a printed job is

1 rough, thumbnail, comprehensive
2 comprehensive, rough, thumbnail
3 thumbnail, comprehensive, rough
4 thumbnail, rough, comprehensive

30 Which type of drawing is a thumbnail layout?

1 full-size tracing
2 small, freehand sketch
3 scale, instrument drawing
4 prototype of finished job

31 The complete covering of a hard-bound book is the

1 cover
2 binding
3 mounting
4 casing

32 The paper substance number (i.e., sub 20) refers to

1 quality
2 amount
3 type
4 weight

33 How many 17" × 22" sheets would be required to print 10,000 8 1/2" × 11" letterheads, allowing for 10% spoilage?

(1) 2,500
(2) 2,550
(3) 2,700
(4) 2,750

34 Which type of stitching is used to staple a pamphlet in the fold?

1 side stitching
2 machine stitching
3 saddle stitching
4 edge stitching

35 How many numbered pages are produced by a double fold in a single sheet of paper?

(1) 16
(2) 12
(3) 8
(4) 4

36 The printing term "bleed" means there is

1 no margin between the image and the edge of the sheet
2 excessive moisture being absorbed by the sheet
3 ink soaking through the sheet
4 sheet overhang on the infeed table

37 Printing a "reverse" means printing

1 both sides of a sheet with one pass through a press
2 an image of a different color on top of another image
3 the background and leaving the image the color of the paper
4 a page so that it could be read in a mirror

38 The most common material used to fasten images to pasteup board is

1 paste
2 wax
3 masking tape
4 transparent tape

39 To "crop" a photograph means to

1 remove the white borders
2 change the size of the photograph by reduction
3 indicate areas to be eliminated
4 airbrush out unwanted areas

40 What is the procedure of producing a clear area on a negative by photographing red masking film on a pasteup?

1 back-up
2 door
3 window
4 slip

Unit B Communication Media (41-56)

41 Which type of printing involves knife-cut stencils?

1 screen
2 offset
3 gravure
4 letterpress

42 Which of the following is a synthetic monofilament fabric used for screen printing?

1 silk
2 polyester
3 organdy
4 cotton

43 Which of the following is a natural multifilament fabric used for screen printing?

1 silk
2 polyester
3 wire
4 nylon

44 Which device scans documents and pictures and transmits an image by wire or radio?

1 data phone
2 micromat
3 facsimile
4 scanomatic

45 A screen fabric with a 6-XX weave would be classified as a

1	fine weave	3	monofilament material
2	coarse weave	4	synthetic material

46 Electrostatic printing produces images by means of

1 ionization and heat transfer ink
2 electrical charge and toner
3 diazo sensitized paper and hypo
4 actinic light and dye

47 Which type of office machine is used to reproduce copy using only the original?

1	duplicator	3	photocopier
2	offset press	4	mimeograph

48 What type of paper is used for printing newspapers?

1	bristol	3	bond
2	newsprint	4	onion skin

49 The process of setting type in newspapers without using actual type is called

1	phototypesetting	3	photomicrography
2	photostating	4	typesetting

50 Which is the name of the system of making maps from photographs?

1	pantograph	3	photogrammetry
2	photogravure	4	photoengraving

51 When a heavy deposit of ink is required, which form of printing could be used?

1	screen	3	gravure
2	offset	4	relief

52 Guidelines for photomechanical work should always be light and accurate. The best color to use for most photographic film is

1	blue	3	red
2	green	4	yellow

53 Which method of printing allows for more variations of printing from a flat surface?

1 relief
2 intaglio
3 planographic
4 letterset

54 Transfer release paper is used for screenprinting on

1 plastic
2 metal
3 paper
4 textiles

55 Dry transfer, strike-on machines, and clip art are all methods of which type of image generation?

1 cold composition
2 hot composition
3 rub-on
4 photomechanical

56 When the photo-indirect process for screen printing is used, the image carrier is prepared by

1 adhering a photo-stencil
2 coating with a photo-emulsion
3 adhering lacquer-base material
4 adhering water-base material

Unit C Photography (57-94)

57 When film is processed, which step renders the film insensitive to further reaction to light?

1 developer
2 stop bath
3 fixer
4 hypo clearing bath

58 The latent image becomes visible on a film emulsion when the film is placed in the

1 photo-flo
2 stop bath
3 developer
4 fixer

59 The size of the image at the focal plane of a camera lens depends on the

(1) focal length
(2) f/number setting
(3) film size
(4) lens diameter

60 If both percentage tapes on a process camera are set at 50%, what is the image size compared to the size of the copy?

(1) the same size (3) 50% larger
(2) twice as large (4) one-half as large

61 In photomechanical work, unwanted light-interference patterns are called

1 newton rings 3 moiré patterns
2 contact spots 4 halation

62 Which density screen is used to print a halftone on standard newsprint stock?

(1) 65 line (3) 133 line
(2) 120 line (4) 300 line

63 The best procedure for photographing a printed halftone at 100% is to take the picture

1 as if it were a normal halftone
2 as a line shot
3 with a red filter
4 with a yellow filter and overdevelop

64 Which procedure should be used to make a halftone of a photograph that has very dense shadow areas?

1 dodging 3 overdevelopment
2 a bump exposure 4 a flash exposure

65 A photographer uses a gray scale to

1 weigh chemicals 3 standardize development
2 check halftones 4 adjust fixing time

66 What is the optimum temperature for film development (as suggested by most film manufacturers)?

(1) 10 degrees C (3) 75 degrees F
(2) 30 degrees C (4) 68 degrees F

67 A cameraman preparing photomechanicals uses a light integrator to

1 allow line and halftone to be shot together
2 standardize film exposure
3 reduce exposure time
4 reduce development time

68 Which process uses one negative to burn many images on a plate?

1 do over
2 step and repeat
3 jump
4 signature

69 Which type of filter is appropriate for working with orthochromatic film?

1 light green
2 light yellow
3 Wratten 4-j
4 Wratten 1-a

70 In a three-bath developing operation, a few drops of fixer in the developer may

1 destroy its effectiveness
2 help speed up development
3 prolong its life
4 increase contrast

71 Which type of filter is used to eliminate yellow from photomechanical copy?

1 red
2 yellow
3 blue
4 brown

72 Twice as much light is allowed through a lens at an f/stop of f/16 than at an f/stop of

(1) f/4.5
(2) f/5.6
(3) f/8
(4) f/22

73 Which is the process of enlarging and printing only the desirable portion of a negative?

1 dodging
2 cropping
3 vignetting
4 spot printing

74 Compared to the color tone of film exposed by photoflood illumination, the color tone of film exposed by daylight illumination is more

1 chartreuse
2 red
3 green
4 blue

75 A flash guide number is 220 and the distance to the subject is 10 feet. What is the proper f/number to use for the camera setting?

(1) f/8
(2) f/11
(3) f/16
(4) f/22

76 Which of the following compounds is combined with silver nitrate crystals to produce silver halide?

1 barium sulfate
2 silver chloride
3 potassium bromide
4 chlorobromide

77 Which method of printing produces photographic prints the same size as the negative?

1 conventional printing
2 stabilization printing
3 projection printing
4 contact printing

78 What causes graininess in a film?

1 overdevelopment of the negative
2 large silver halide crystals
3 reducer in the developer
4 improper fixation

79 Which term describes the ability of a film emulsion to accommodate some variations in exposure?

1 factors
2 latitude
3 index
4 equivalent

80 Which characteristics are typical of a film which has an emulsion composed of very large silver halide crystals?

1 grainy, low speed, high contrast
2 grainy, low speed, low contrast
3 grainy, high speed, low contrast
4 grainy, high speed, high contrast

81 An ASA rating of 32 indicates that a film is

1 slow
2 fast
3 designed for slides
4 designed for prints

82 If the temperature of a film developer is 10 degrees higher than recommended, the film will be

1 underdeveloped
2 overdeveloped
3 too brittle
4 too soft

83 The purpose of the antihalation backing on a film is to absorb light rays and

1 prevent distortion of the film
2 extend the shelf life of the film
3 convert silver halide to metallic silver
4 stabilize the speed of the film

84 Daylight color film is balanced for approximately 5,500 degrees Kelvin. What cast will this film tend to have if used with light sources of lower Kelvin ratings?

1 bluish
2 greenish
3 yellowish
4 reddish

85 Which of the following film types is sensitive to only blue, green, and yellow light?

1 blue sensitive
2 orthochromatic
3 panchromatic
4 stabilization

86 Which is the standard order of steps for processing negatives?

1 developer, fix, water, stop bath
2 developer, water, stop bath, fix
3 developer, stop bath, fix, water
4 developer, fix, stop bath, water

87 Which ASA film rating would require that a camera be set at one f/stop faster than a film with an ASA rating of 200?

(1) 100
(2) 250
(3) 300
(4) 400

88 An exposure is made at f/16 for 10 seconds. Which f/stop setting should produce the same degree of exposure during a 20-second interval?

(1) f/8
(2) f/11
(3) f/22
(4) f/32

89 Which procedure for darkening a specific area allows light from only a specific area of the negative to reach the print during enlarging?

1 spot printing
2 dodging
3 cropping
4 vignetting

90 If the exposure time remains constant, which adjustment must be made to produce an enlargement from a process camera?

1 Increase the angle of the incident light.
2 Decrease the angle of the incident light.
3 Close the aperture of the lens.
4 Open the aperture of the lens.

91 The f/stop setting of a camera regulates the

1 sharpness of the image on the film
2 speed of the shutter
3 distance of the lens from the film
4 amount of light passing through the lens

92 Which adjustment should be made to a camera to maintain a uniform exposure if the intensity of a light source decreases?

1 Increase the aperture opening.
2 Decrease the aperture opening.
3 Increase the distance setting.
4 Decrease the distance setting.

93 The visible image of a negative is composed of

1 silver halide
2 potassium crystals
3 metallic silver
4 barium sulfate

94 What is the diameter of the aperture of an 8-inch-focal-length lens set at f/16?

(1) 1 in
(2) 3/4 in
(3) 1/2 in
(4) 1/4 in

Unit D Processes (95-148)

95 Which tool is used for measuring objects in the printer's point system?

1 type-high gauge	3 gray scale
2 line gauge	4 composing stick

96 An assortment of all the letters, figures, and punctuation marks of one size and face of type is called a

1 family	3 series
2 case	4 font

97 Which process produces photographic or strike-on images for body composition by recording the images on magnetic or paper tape?

(1) CRN	(3) facsimile
(2) indirect	(4) scanomatic

98 Which of the following sets of initials identify an automatic means of direct reading and recognition of data in printed or hand-lettered form?

(1) OCR	(3) CRN
(2) NCR	(4) RCN

99 Gravure belongs to the general category of printing known as

1 stencil printing	3 intaglio printing
2 planographic printing	4 relief printing

100 Which method of printing is based on the principle that grease and water will not mix?

1 gravure	3 letterpress
2 mimeograph	4 offset lithography

101 Which type of table has a flat metal surface used for lockup?

1 lockup table	3 planner table
2 chase table	4 imposing table

102 The image produced on a sheet of paper by a press is called

1 a print
2 a copy
3 an impression
4 a sample

103 Letterset or dry offset prints are produced by the

1 direct plate
2 relief plate, only
3 relief plate and blanket
4 reverse plate and blanket

104 Which of the following is a wetting agent that reduces spotting on film?

1 oil
2 fixer
3 ammonia
4 photo-flo

105 On most presses, a print with a four-sided bleed cannot be produced without trimming the sheet because the

1 gripper margin cannot be printed
2 rollers do not go to the edge of the sheet
3 press cannot print full solid
4 ink would print on the back cylinder

106 The method of printing two sides of a sheet using the same gripper edge is called

1 work and twist
2 work and tumble
3 work and turn
4 sheetwise

107 Which of the following would be used to print one area of a page with one color at less than full density?

1 more fountain etch
2 tint screen
3 a silhouette
4 a gray-out

108 In order to hold chemicals properly, surface plates should be

1 heated
2 dried
3 grained
4 rubbed

109 Raising or depressing the surface of paper in a set design or form is called

1 die-cutting
2 embossing
3 raising
4 carving

110 A halftone or tint printed with its edges faded off is called a

1 fade
2 vignette
3 silhouette
4 blend

111 Two printing processes suitable for printing on cylindrical objects are

1 gravure and intaglio
2 screen process and flexography
3 letterpress and offset
4 lithography and planography

112 Which method of printing requires the use of a doctor blade?

1 screen process
2 offset
3 gravure
4 letterpress

113 Which marks indicate the dimensions of a halftone?

1 crop marks
2 register marks
3 lead marks
4 halftone marks

114 For normal photo-offset printing, the ideal pH for fountain solution is

(1) 7.0
(2) 5.6
(3) 3.0
(4) 4.0

115 A press which prints both sides of the paper at the same time is a

1 two-color press
2 stream-fed press
3 web press
4 perfecting press

116 Which unit is used to measure wood type?

1 lines
2 stick
3 agate
4 nonpareil

117 Which of the following is a method for cataloging, identifying, and mixing ink colors?

(1) R.O.P. color
(2) P.M.S. system
(3) tone mixing
(4) U.S. standard

118 The process of burning the same form 2-up on an offset plate using only 2 tabs and pins is called

1	slide	3	swing
2	step	4	double

119 What is the purpose of a Ludlow machine?

1	printing 2-color work	3	gluing edges of pads
2	embossing sheets	4	casting display type

120 What is the purpose of using a powder anti-offset spray on a printing press?

1 as a drying agent for the ink
2 as an oxidizer for the ink
3 to prevent paper from sticking to the plate
4 to prevent heat from drying the ink

121 How should a stripper burn a black caption on a light halftone?

1 Cut out the halftone.
2 Sandwich a reversal with a halftone.
3 Make a proof on a photograph.
4 Make one surprint.

122 Which is the roller between the fountain roller and the ink distributor roller on a printing press?

1	idler roller	3	form roller
2	ductor roller	4	jumbo roller

123 A gelatine method of printing dotless halftones is called

1	a screen process	3	gravure
2	collotype	4	intaglio

124 What is foundry type composed of?

1 lead and copper
2 copper, nickel, and antimony
3 lead, brass, and tin
4 lead, tin, and antimony

125 What will occur if the water-roller pressure on a printing press is too great?

1 The ink will be too dark.
2 The press will run slower.
3 The paper will not feed.
4 The image will lighten.

126 One of the dimensions of the printed sheet on a web press is determined by the

1 horn folder
2 paper weight
3 speed of the press
4 cutoff

127 Gum arabic is an ingredient in

1 fixer
2 developer
3 fountain solution
4 ink thinner

128 Which type of surface is required for letterpress printing?

1 engraved
2 relief
3 flat
4 sensitized

129 In which type of offset printing press do the sheets overlap on their way down the feed board?

1 stream fed
2 web fed
3 roll fed
4 continuous fed

130 A complete group of type faces having related characteristics is called a

1 gravure
2 font
3 family
4 style

131 Type which has any portion of the type face projecting beyond the type body is called a

1 ligature
2 logotype
3 slug
4 kerned letter

132 The term "fake engraving" refers to the type of printing called

1 lithography
2 thermography
3 flexography
4 planography

133 Which type of printing press prints on a continuous roll of paper?

1 stream fed
2 roll fed
3 web fed
4 continuous fed

134 If two or more tint screens are laid on top of the other in color-process printing, it may cause an undesirable pattern called

1 moiré
2 plaid
3 chevron
4 blurred

135 Gum arabic is used on a printing plate to

1 make plate corrections
2 desensitize the plate
3 clean the plate
4 protect a developed plate

136 Additive offset printing plates are processed by

1 removing the factory coating in the unexposed areas
2 removing the unexposed areas with a warm water spray
3 rubbing a coating onto the exposed areas
4 rubbing the unexposed areas with a desensitizer

137 Halftone dots appear to be continuous at a normal viewing distance. This effect is due to the eye being unable to

1 differentiate varying dot sizes
2 resolve small patterns
3 visualize the standard moiré pattern
4 resolve a dot density of 1.60

138 Stripping refers to the process of

1 placing a negative on a masking sheet
2 pasting-up photographic copy on a copyboard
3 exposing a plate
4 developing a negative

139 The main limiting factor in the reproduction of continuous-tone photographic materials is that the

1 size of the tone photograph is limited
2 press cannot reproduce tone material
3 press can place only one layer of ink at a time
4 printer must be highly skilled

140 Which is a device for measuring opacity?

1 light meter
2 densitometer
3 dot area meter
4 opaque mirror

141 In the offset press, ink passes to the sheet of paper directly from the

1 blanket
2 plate
3 impression cylinder
4 form roller

142 A normal amount of space required for "gripper bite" on most offset duplicators is

(1) 1 in
(2) 1/2 in
(3) 1/4 in
(4) 1/8 in

143 The plate cylinder of an offset press receives ink directly from the

1 fixed distributors
2 upper oscillator
3 ductor roller
4 form rollers

144 The "grippers" on small offset duplicators hold sheets on the

1 feed cylinder
2 blanket cylinder
3 plate cylinder
4 impression cylinder

145 In a photographic continuous-tone print, the highlight density is 0.12 and the shadow density is 1.70. The density range of the print is

(1) 1.82
(2) 1.70
(3) 1.58
(4) 0.12

146 Which of the following is a type of halftone screen?

1 auto-cross, positive screen
2 glass contact screen
3 contact, negative screen
4 collotype gelatine screen

147 Which types of exposures are used to produce halftone negatives?

1 main, flash, and screen
2 main, bump, and screen
3 main, bump, and flash
4 bump, screen, and flash

148 Which is the procedure for burning a plate in which a black caption will appear on a dark halftone?

(1) 1 burn with 2 flats
(2) 2 burns with 2 flats
(3) 2 burns with 1 flat
(4) 1 burn with 1 flat

Unit E Industrial Organization (149-151)

149 The person who sets type from the copy is called a

1 pressman
2 compositor
3 layout person
4 cameraman

150 The job of making up the flat in offset printing is the responsibility of the

1 artist
2 layout person
3 cameraman
4 stripper

151 When a printing job is being produced, the "feeder" works directly with the

1 pressman
2 bindery
3 papercutter
4 platemaker

Unit F Background (152-157)

152 Who invented movable type?

1 Gutenberg
2 Senefelder
3 Faust
4 Franklin

153 The basic lithographic principle was invented by

1 Franklin
2 Daguerre
3 Gutenberg
4 Senefelder

154 The earliest paper manufactured by the Egyptians was called

1 reed
2 bristol
3 papyrus
4 rice paper

155 The principles of offset lithography originated in

1 Italy
2 France
3 England
4 Bavaria

156 Which method of printing has made the greatest impact on the printing industry?

1 gravure
2 letterpress
3 screen
4 photo-offset

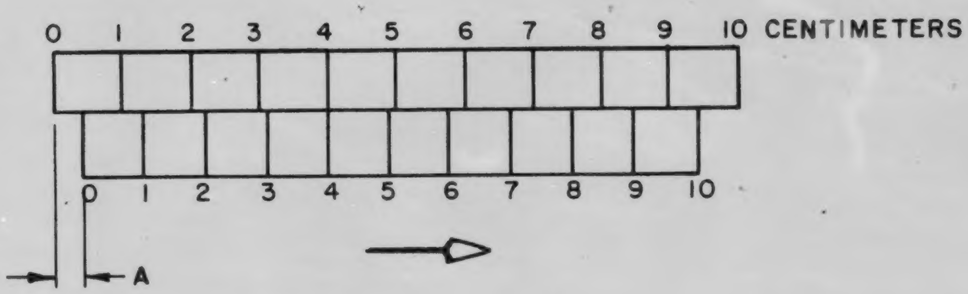
157 Which type of pen is most suitable for technical illustrating?

1 technical
2 ball point
3 speed ball
4 ruling

Part II Engineering Drawing

Unit A Language (158-189)

158 The diagram below represents the bottom scale of a vernier moved to the right until the 4's line up. How long is distance A?



(1) 40 mm
(2) 0.004 cm
(3) 0.040 cm
(4) 0.400 cm

159 Which term is an expression of slope?

1 triangulation
2 bearing
3 base angle
4 batter

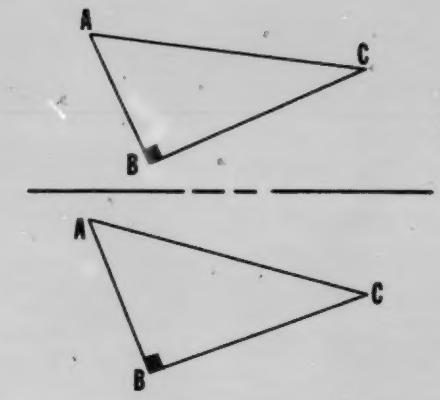
160 Which symbol shown below does not represent a geometric tolerance of form?

(1) ⌭ (3) ⊥

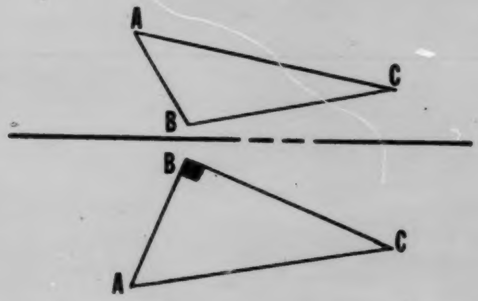
(2) ∠ (4) ⌖

161 Which revolution shown below accurately describes a true 90° angle B?

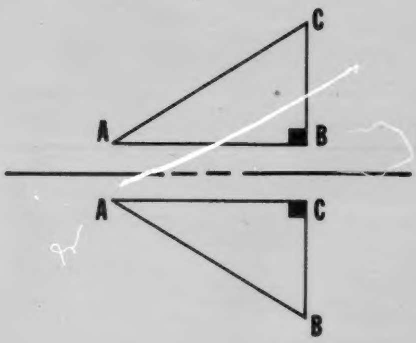
(1)



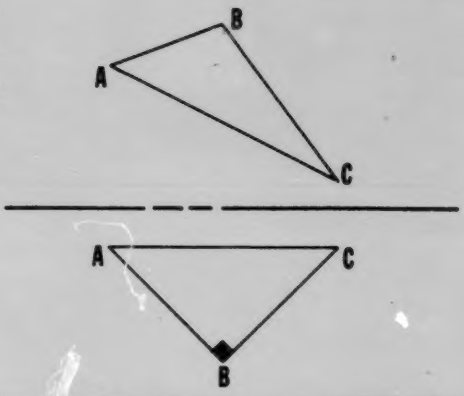
(3)



(2)



(4)



162 Which measurement below would be a preferred metric drill size in designing a metric-based component?

(1) Ø7.10 mm
(2) Ø7.30 mm
(3) Ø7.50 mm
(4) Ø7.75 mm

163 Which of the metric unilateral tolerances given below is stated correctly?

(1) ←— 42.75 ± 0.127 —→
(2) ←— 42.750 ± 0.127 —→
(3) ←— 42.75 ± .127 —→
(4) ←— 42.750 ± .127 —→

164 What is the meaning of the abbreviation "SI" in relation to the metric standards of the General Conference of Weights and Measures?

1 International System of Units
2 United States Units
3 Steel Industry Units
4 Scientific Identification of Units

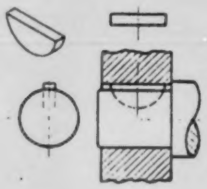
165 What is the correct method of indicating "one thousand two hundred millimeters" according to the International System of Units?

(1) 1,200 mm
(2) 1 200 mm
(3) 1.200 mm
(4) 1200 mm

166 In a complete decimal dimensioning system, fractions are used to measure

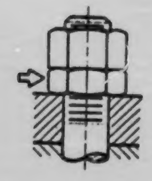
1 size dimensions, only
2 drilled holes, only
3 size and location dimensions
4 drilled and threaded holes

167 Which type of key is illustrated in the diagram below?



1 Gib key
2 semicircle key
3 Pratt & Whitney key
4 Woodruff key

168 What type of nut is indicated by the arrow in the diagram below?



1 jam nut
2 flat nut
3 clamp nut
4 castle nut

169 The amount that a dimension may vary and still be acceptable is known as

1 allowance
2 tolerance
3 limits
4 clearance

170 What is the angle between a tangent and the radius of a circle at the point of tangency?

(1) 30°
(2) 45°
(3) 60°
(4) 90°

171 A six-inch object would be represented by a three-quarter inch line on a drawing that had a scale of

(1) 1/16 in
(2) 1/8 in
(3) 1/4 in
(4) 5/16 in

172 Which of the figures listed below represents a fraction with a denominator of 1,000?

(1) 0.3
(2) 0.03
(3) 0.003
(4) 0.0003

173 On an orthographic projection of a three-dimensional object, centerlines indicate the center of

1 the drawing
2 a symmetrical detail
3 an asymmetrical detail
4 the front view

174 What type of drilled hole does not go all the way through an object?

1 blind hole
2 dead hole
3 reamed hole
4 pointed hole

175 Which lines on a drawing indicate the different possible positions of a switch handle?

1 hidden lines
2 stitch lines
3 phantom lines
4 datum lines

176 Components of an electrical system are represented on an electrical diagram by

1 dimensions
2 graphic symbols
3 proper line weights
4 circuits

177 Which of the following is an example of a local note?

(1) "Break Sharp Edges"
(2) "Decimal Tolerance .005 Unless Otherwise Specified"
(3) "Material: Cast Iron"
(4) "1/2 Drill, 2 Holes, In Line"

178 Which geometric shape listed below is a plane figure?

1 cone
2 square
3 pyramid
4 sphere

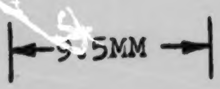
179 A drawing of an object is scaled 1/4" = 1". A 1 5/8-inch line on the drawing would correspond to a length on the object of

(1) 13/32 in
(2) 3 1/2 in
(3) 4 5/32 in
(4) 6 1/2 in

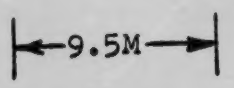
180 Which size is used to obtain the limits derived by the application of allowances and tolerances?

1 rounded-off size
2 interchangeable size
3 nominal size
4 basic size

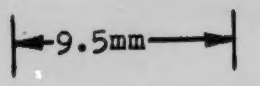
181 Which of the dimensions listed below represents a correct designation of millimeter dimensioning?



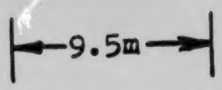
(1)



(2)



(3)



(4)

182 Which scale listed below is used on maps?

1 architectural engineer's scale
2 civil engineer's scale
3 mechanical engineer's scale
4 graphic engineer's scale

183 The maximum and minimum sizes indicated by a toleranced dimension are known as

1 allowances
2 tolerances
3 limits
4 clearances

184 What is the amount of space between mating parts called?

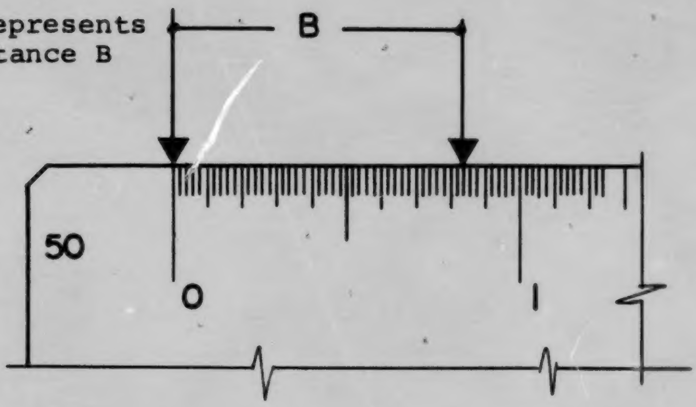
1 allowance
2 tolerance
3 limits
4 clearance

185 What does the symbol Ø represent?

1 area
2 diameter
3 circumference
4 radius

186 The diagram at the right represents a decimal-inch scale. Distance B is equal to

(1) 0.042 in
(2) 0.084 in
(3) 0.420 in
(4) 0.840 in



187 Which metric limit dimension listed below is stated correctly?

(1) $\longleftarrow \begin{array}{c}15\\15.25\end{array} \longrightarrow$

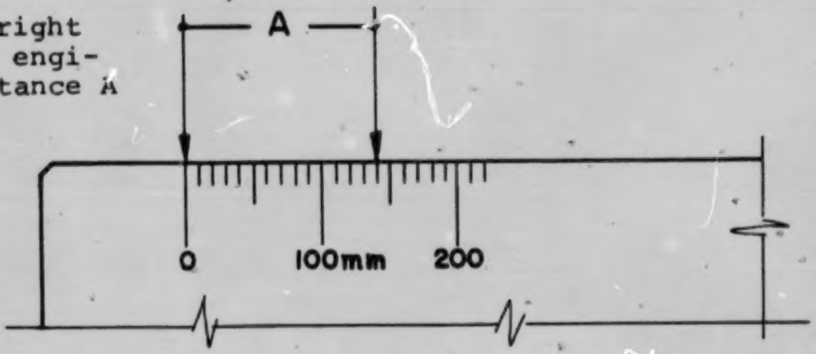
(3) $\longleftarrow \begin{array}{c}15.25\\15\end{array} \longrightarrow$

(2) $\longleftarrow \begin{array}{c}15.00\\15.25\end{array} \longrightarrow$

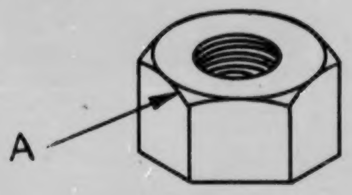
(4) $\longleftarrow \begin{array}{c}15.25\\15.00\end{array} \longrightarrow$

188 The diagram at the right represents a metric engineering scale. Distance A is equal to

(1) 10.4 mm
(2) 104 mm
(3) 140 mm
(4) 1,400 mm



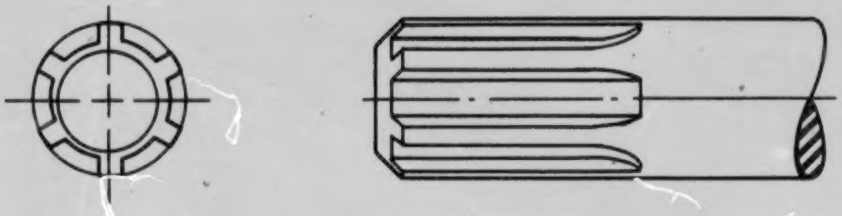
189 A hex nut that has been chamfered is shown below. What type of curve is indicated by letter A?



1 hyperbolic
2 circular
3 elliptical
4 parabolic

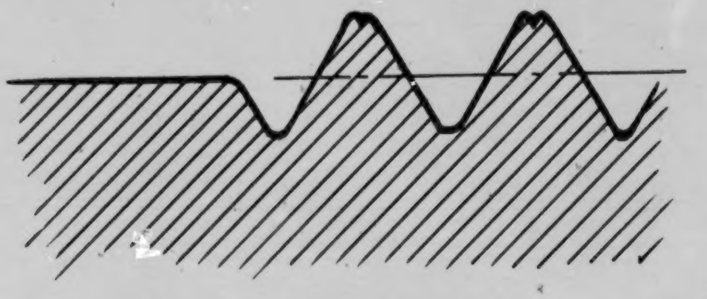
Unit B Tools and Techniques (190-211)

190 What type of shaft is represented by the drawing shown below?



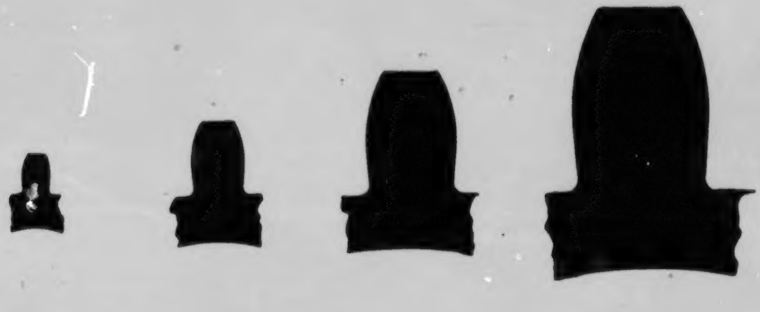
1 serrated shaft
2 splined shaft
3 geared shaft
4 slotted shaft

191 The sectioned view shown below represents the profile of a screw thread. By which process was it formed?



1 rolling
2 machining
3 tapping
4 chasing

192 Which diagram best represents an involute gear tooth with a diametral pitch of 2?

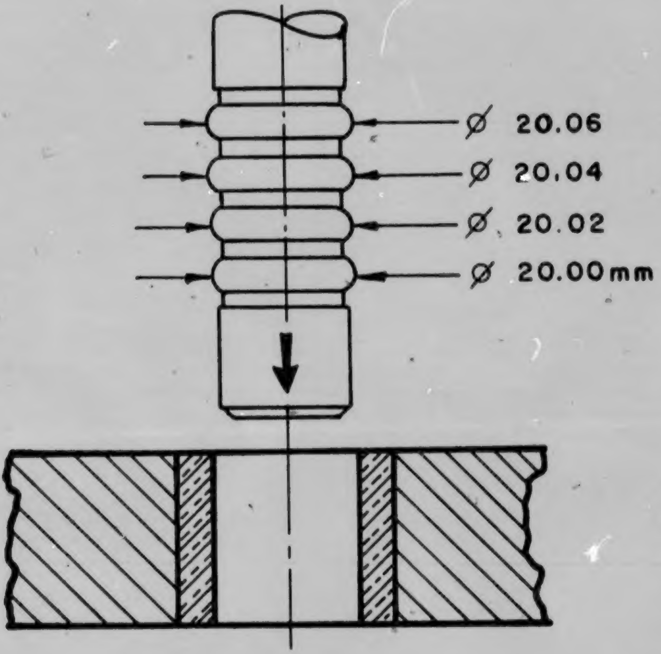


SCALE 1:1

193 One function of an oil film between a shaft and a bearing is to

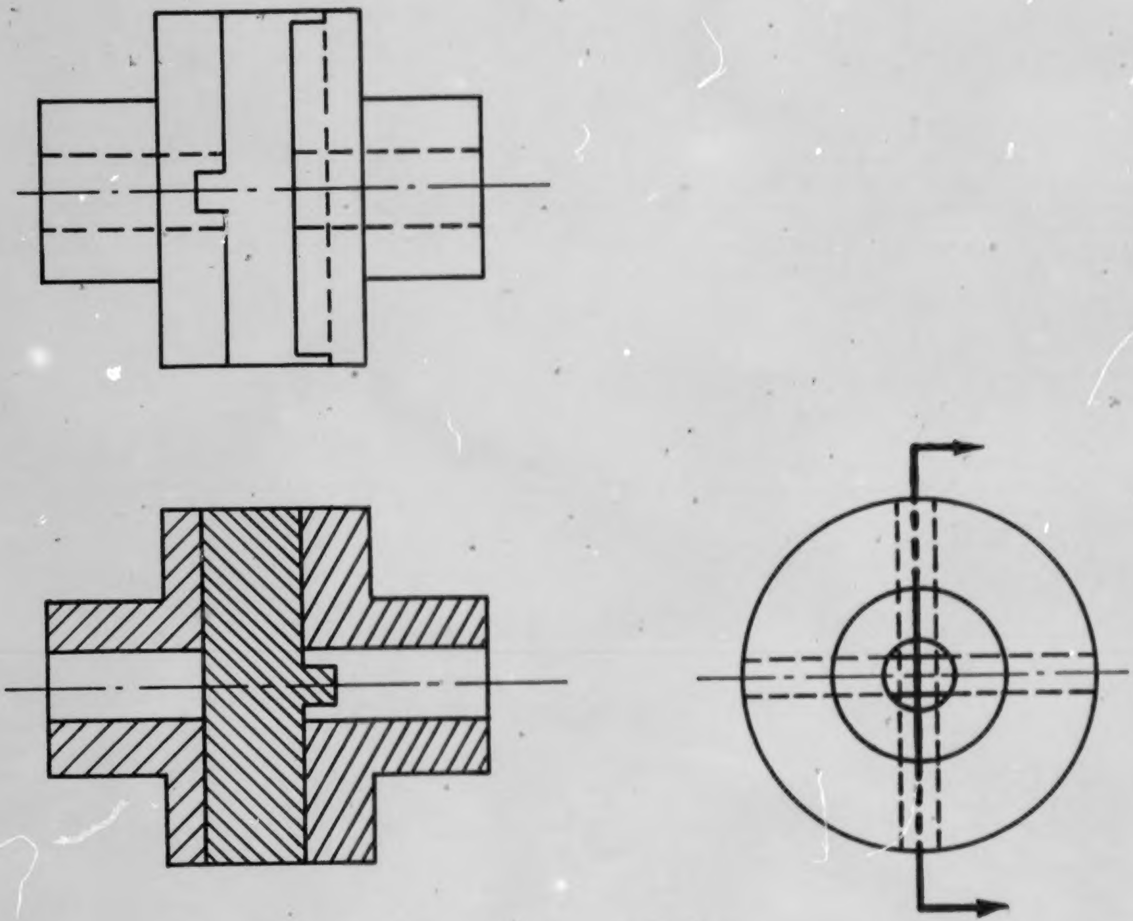
1 absorb shock
2 take up slack
3 dissipate heat
4 eliminate vibration

194 The drawing shown below represents a bearing that is being sized. What is the term for this process?


Ø 20.06
Ø 20.04
Ø 20.02
Ø 20.00mm

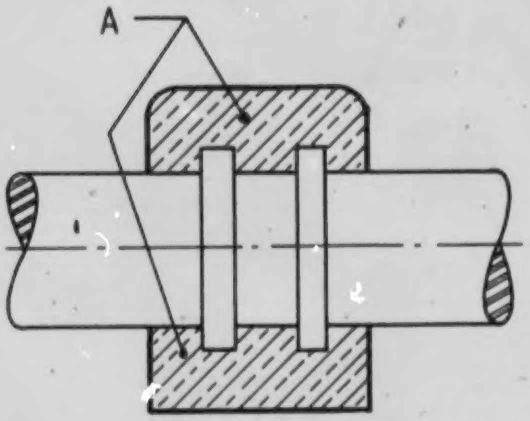
1 burnishing
2 broaching
3 reaming
4 swagging

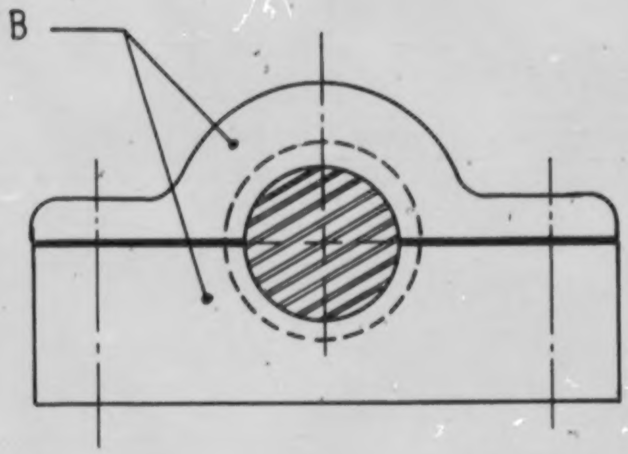
195 What does the three-view drawing shown below represent?



1 a clutch
2 a universal joint
3 a coupling
4 a split pulley

196 In the two diagrams shown below, what type of bearing is indicated by letters A and B?





1 a journal bearing
2 a footstop bearing
3 a torsional bearing
4 a thrust bearing

197 The letters DP on a detail drawing are the symbol for

1 depth perspective
2 diametral pitch
3 drop forge
4 duplicate

198 A piece of 0.80-millimeter-thick steel is bent 90° with a bend radius of 5.0 millimeters. The amount of bend allowance will be closest to

(1) 2.21 mm
(2) 5.05 mm
(3) 8.27 mm
(4) 12.41 mm

199 One important advantage of the microfilm reproduction of drawings over other methods is that microfilm reproduction

1 provides duplicate copies for security
2 is cheaper
3 does not require the storage of chemicals
4 does not require a darkroom for processing

200 Which copying process involves the use of aperture cards?

1 Photostat
2 Xerox
3 Verifax and Thermofax
4 microfilm

201 Which copying process uses reflected light as a method of exposure?

1 blueprint
2 microfilm
3 diazo (dry)
4 diazo (moist)

202 Plastic leads should be used with which medium?

1 vellum papers
2 tracing papers
3 tracing cloth
4 polyester-base film

203 When straight lines and arcs are drawn tangent to each other, what should be constructed first?

1 the arcs
2 the straight lines
3 the point of tangency
4 the angle of tangency

204 A French curve is used to draw a plotted curve. What is the minimum number of points needed to fit a given section of the French curve at one time?

1 five
2 two
3 three
4 four

205 Compared to the length of a compass pencil lead, the compass needle point should be

1 always slightly longer
2 always slightly shorter
3 always the same length
4 sometimes longer and sometimes shorter

206 In order to obtain the best copy results, pencil lines should be

1 frosted
2 opaque
3 transparent
4 translucent

207 What is the developer in the basic diazo process of reproducing drawings?

1 hydrochloric acid
2 ultraviolet light
3 ammonia
4 infrared light

208 Which condition will cause a diazo copy to be too dark?

1 setting the machine speed too fast
2 setting the machine speed too slow
3 using weak developer
4 using outdated copy paper

209 Which medium is best suited for general use with either pencil, ink, printing, or typing?

1 vellum paper
2 tracing paper
3 tracing cloth
4 polyester-base film

210 Which instrument can be used to draw the largest circle?

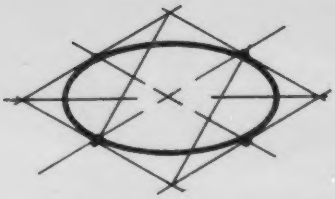
1 a beam compass
2 a bow compass
3 a bow pencil
4 a straight-leg compass

211 Which instrument is used to draw dimension lines for dimension angles?

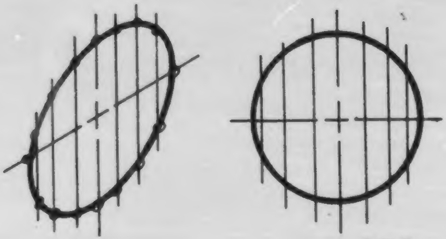
1 a straightedge
2 a compass
3 a drafting machine
4 a parallel rule

Unit C Shape Description (212-241)

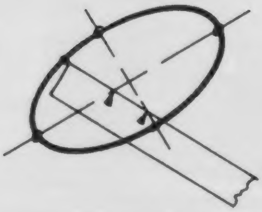
212 Which drawing does not represent a method used in constructing isometric ellipses?



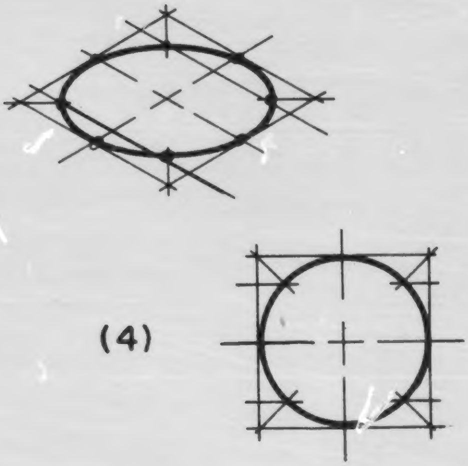
(1)



(3)

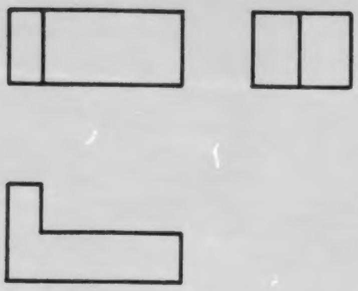


(2)

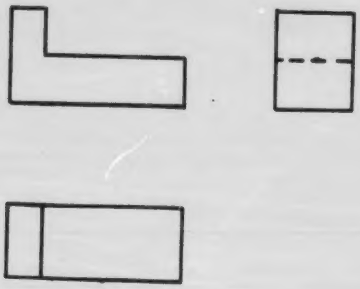


(4)

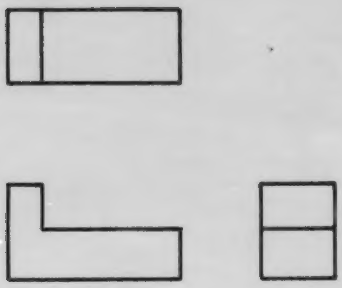
213 Which drawing shown below is an example of first-angle projection?



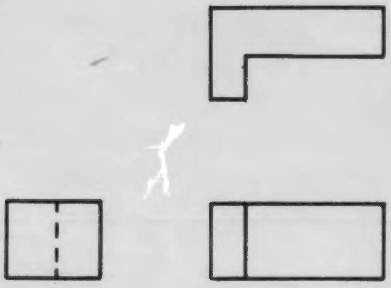
(1)



(2)

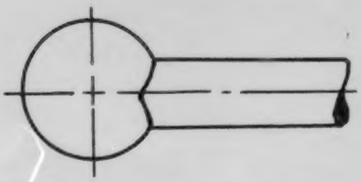


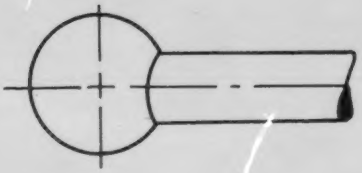
(3)

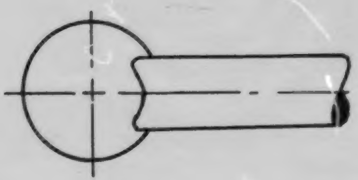


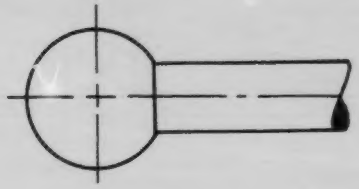
(4)

214 Which diagram below best represents the line of intersection between a sphere and a cylindrical shape?

(1)


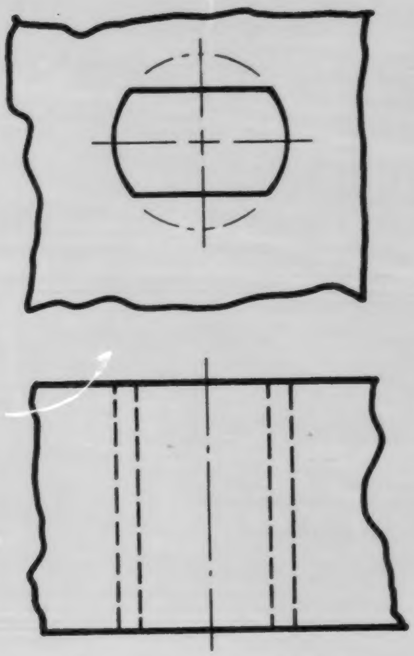
(2)


(3)


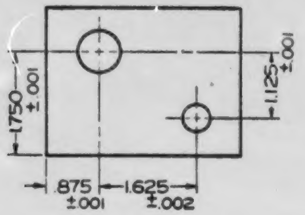
(4)


215 The hole shown in the diagram at the right would most likely be formed by the process of

1 drilling
2 reaming
3 broaching
4 boring

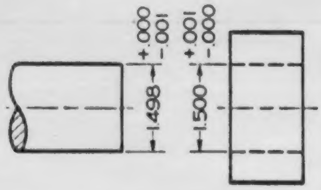


216 What type of dimensioning is used in the diagram shown below?


1.750
±.001
1.125
±.001
.875
±.001
1.625
±.002

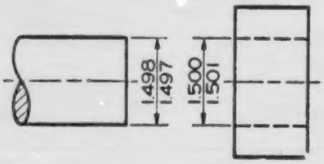
1 bilateral tolerance
2 unilateral tolerance
3 limits
4 allowance

217 What type of dimensioning is used in the diagram shown below?


1.498
+.000
-.001
1.500
+.001
-.000

1 bilateral tolerance
2 unilateral tolerance
3 limits
4 allowance

218 What type of dimensioning is used in the diagram shown below?


1.498
1.497
1.500
1.501

1 bilateral tolerance
2 unilateral tolerance
3 limits
4 allowance

219 An auxiliary view of an object may be required if the object has

1 more than four sides
2 no symmetrical sides
3 a detail on a plane parallel to a given view
4 an inclined surface not parallel to a given view

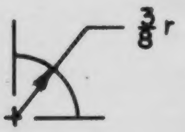
220 Circles that represent holes on a drawing are located in relation to

1 the centerlines of the circles
2 an extension line tangent to the edge of each circle
3 two extension lines representing the diameter of each circle
4 a leader

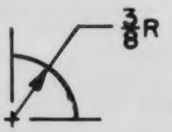
221 A circular centerline on which several holes may be located is called a

1 pitch circle
2 bolt circle
3 phantom circle
4 center circle

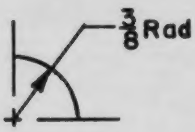
222 Which dimension diagram below is correctly labeled?



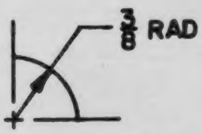
(1)



(2)



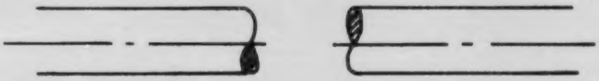
(3)



(4)

223 The drawing shown at the right represents a

1 broken-out section
2 removed section
3 conventional break
4 contemporary break



224 What metal is represented by lines similar to general-purpose section lines?

1 bronze
2 cast iron
3 steel
4 aluminum

225 Which lines are usually omitted in a section drawing?

1 hidden lines
2 crosshatch lines
3 dimension lines
4 centerlines

226 A pictorial drawing that is used to provide technical information by visible methods is known as a

1 lofting
2 block diagram
3 graphic representation
4 technical illustration

227 Which shape should be dimensioned by a radius?

1 drilled hole
2 bored hole
3 fillet
4 cylinder

228 What type of dimensioning relates all dimensions to a single datum surface?

1 unilateral
2 unidirectional
3 base line
4 cumulative

229 A sectional view that shows only a small portion of the interior of an object is known as

1 a detail view
2 a detail section
3 an offset section
4 a broken-out section

230 A sectional view that gives a complete plane view of an object is known as a

1 complete section
2 full section
3 plane section
4 cross section

231 Which symbol is the proper notation of an American Standard thread?

(1) ½-20NF-2
(2) ½-NF20-2
(3) 20-½NF-2
(4) ½-20-2NF

232 Laying out full-size aircraft drawings is called

1 lofting
2 tabulating
3 arranging
4 scaling

233 Which type of drawing most closely resembles a photograph?

1 perspective
2 isometric
3 orthographic
4 oblique

234 The most important characteristic of an isometric drawing is that the

1 linear dimensions are to scale
2 angular dimensions are to scale
3 surface edges vanish to a point on a horizon
4 horizontal surfaces are used with isometric lines

235 What kind of tolerance dimensioning is related to symmetry, concentricity, and straightness?

1 geometric
2 positional
3 knurling
4 angular

236 The length of an object with rounded ends should be determined by measuring the

1 center-to-center distance
2 end-to-end distance
3 end radius
4 end diameter

237 In which system of dimensioning do dimension figures read from the bottom of the page?

1 bottom
2 angular
3 unidirectional
4 aligned

238 When an assembly drawing is sectioned, the section lines should be drawn

1 at the same angle on each separate part
2 at different angles on each separate part
3 as solid lines on all parts
4 as solid lines and broken lines on alternating parts

239 When an offset section is drawn, the cutting-plane line offsets should be

1 omitted in the original offset section
2 included in both views
3 used on both ends of the cutting-plane line
4 slanted at an angle of 90°

240 How far apart should the guidelines used in decimal dimensioning be spaced?

(1) 1/16 in
(2) 1/8 in
(3) 1/4 in
(4) 1/2 in

241 Rendering is usually used for

1 graphic symbols
2 metric dimensions
3 pictorial shading
4 machining operations

Unit D Working Drawings (242-264)

242 The purpose of basic dimensions on detail drawings is to

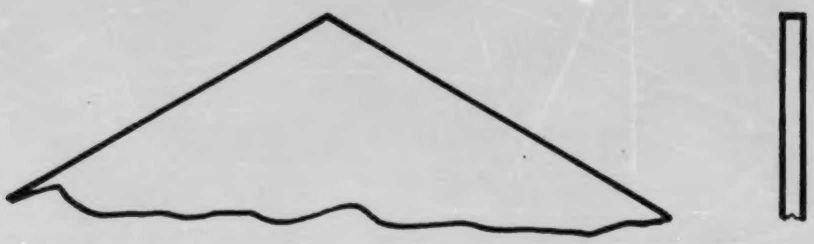
1 provide a scale
2 locate part features
3 locate tolerance zones
4 represent an approximate size

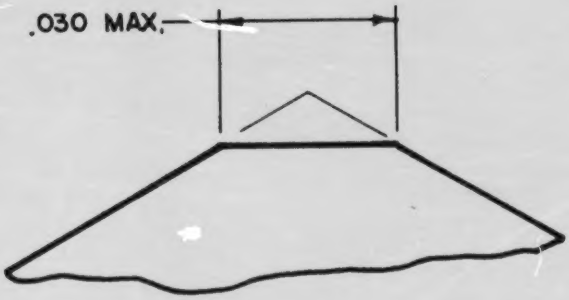
243 A tolerance of draft would most likely appear on a detail drawing of a metal product produced by the shaping process of

1 powder metallurgy
2 forging
3 machining
4 diecasting

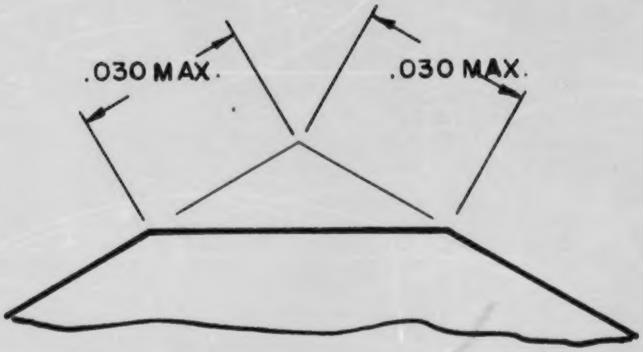
244 Which drawing below is a correct interpretation of the break corners notation shown at the right?

BREAK CORNERS .030 MAX.

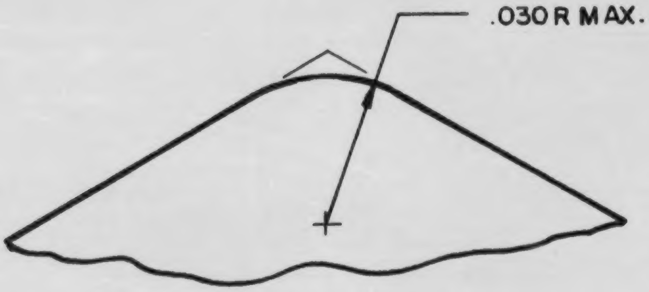




(1)


.030 MAX.
.030 MAX.

(3)



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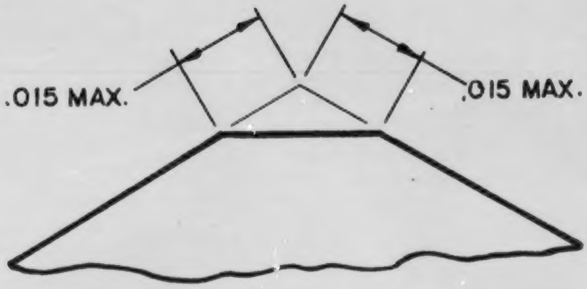
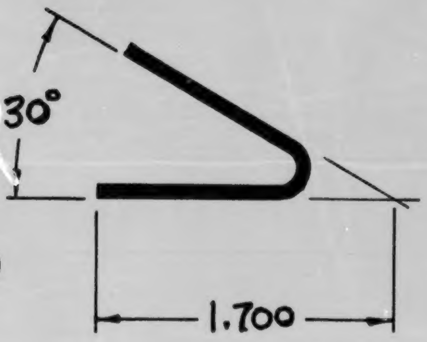

.015 MAX.
.015 MAX.

(4)

245 Which drawing shown below represents the best method for dimensioning a formed piece of sheet steel?

(1)



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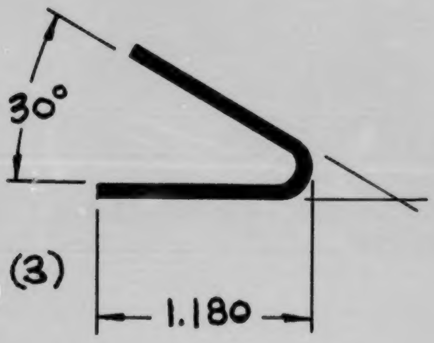

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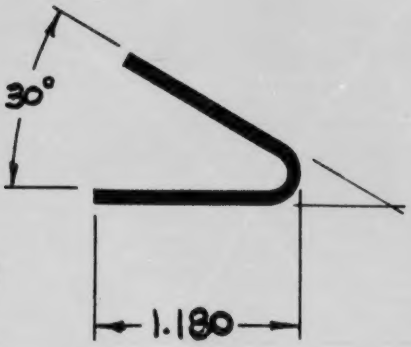

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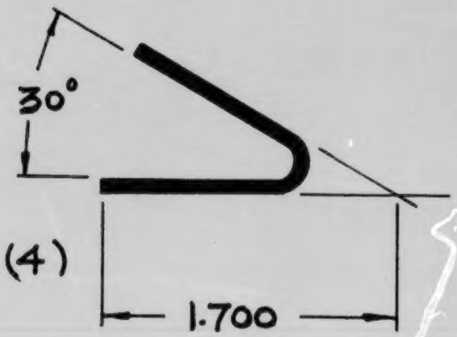
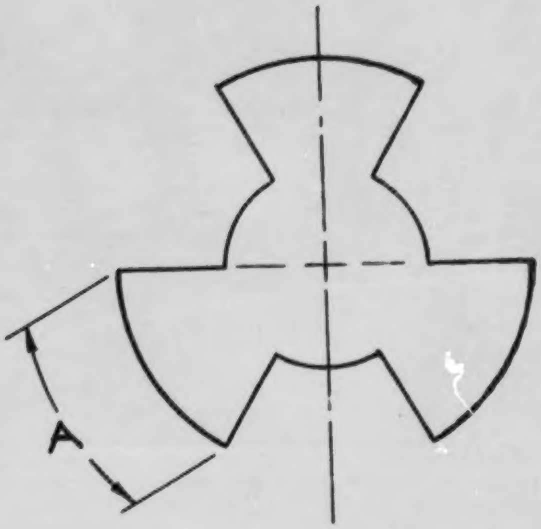


246 In the diagram at the right, dimension A represents the measurement of the

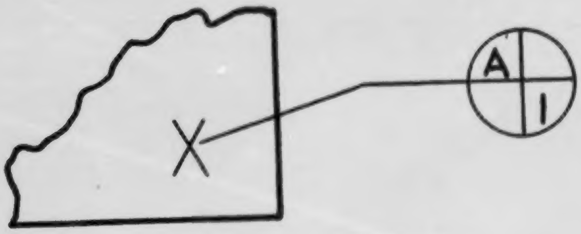


1 length of a chord
2 length of an arc
3 number of degrees in the angle
4 length of a sector

247 An ISO metric thread is designated M12 × 1.5 -6g. The "1.5" designates the thread's

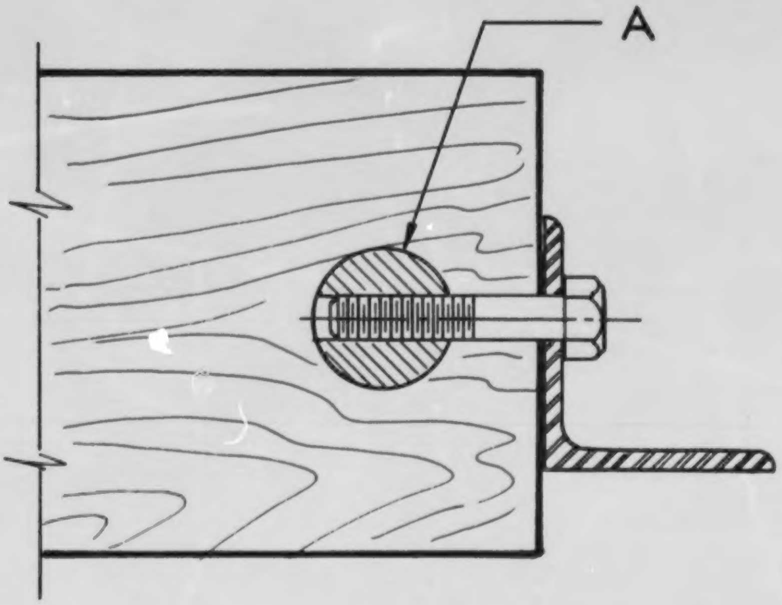
1 diameter
2 series
3 class of fit
4 pitch

248 What is indicated by the X on the drawing shown below?



1 a datum-target symbol
2 a spot-weld symbol
3 an ejector-pin location symbol
4 a punched-hole center symbol

249 The cross-sectional view shown below represents a method of attaching a steel bracket to a wooden frame. What is part A?

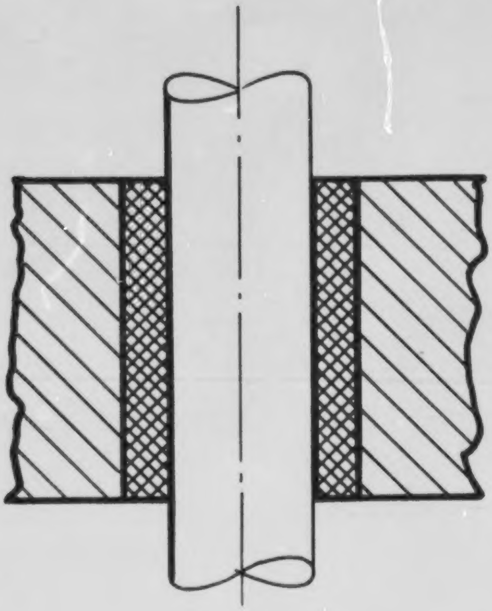


1 cylindrical hardy
2 revolving stud
3 threaded nipple
4 threaded pommel

250 A detail drawing contains the notations "ejector pin marks, flash, caster's mark." The detail drawing is most likely a drawing of a

1 sand-mold casting
2 diecasting
3 investment casting
4 centrifugal casting

251 What is the primary alloying element in the shaft bushing shown in the diagram below?

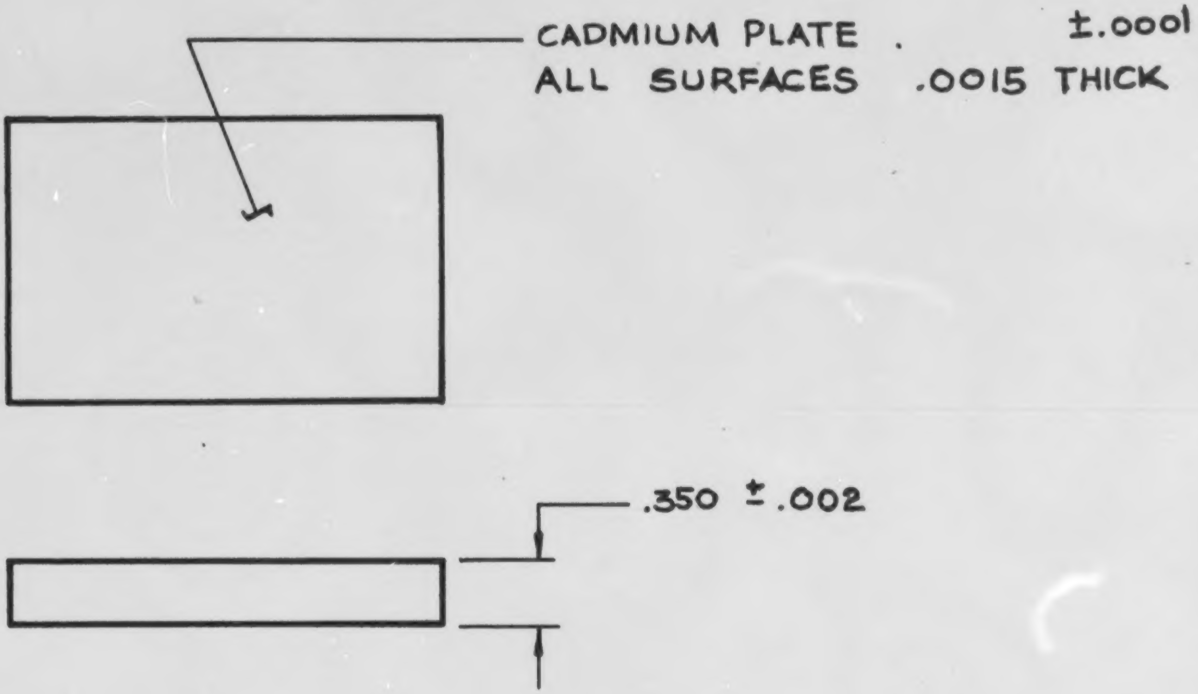


1 copper
2 zinc
3 aluminum
4 magnesium

252 On a detail drawing, the letters MMC and RFS represent

1 modifiers
2 change notes
3 geometric tolerances
4 positional tolerances

253 A steel fixture is to be cadmium plated as shown in the diagram below. What is the maximum allowable thickness of the item, including plating?



(1) 0.3534 in
(2) 0.3536 in
(3) 0.3550 in
(4) 0.3552 in

254 What type of drawing is a projection?

1 working drawing
2 isometric drawing
3 illustration
4 diagram

255 What type of diagram contains an exploded view?

1 welding drawing
2 technical illustration
3 electrical diagram
4 map drafting

256 What type of working drawing shows the information necessary to manufacture a single part?

1 general assembly drawing
2 working assembly drawing
3 parts drawing
4 detail drawing

257 What type of drawing provides sufficient information to produce and put together parts of a product?

1 general assembly drawing
2 working assembly drawing
3 parts drawing
4 detail drawing

258 If the letter B is included with a drawing number, then the drawing is

1 a copy of an original
2 on standard 11" × 17" or 12" × 18" size paper
3 the second in a series of drawings
4 an assembly drawing

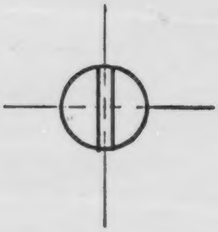
259 How should considerable changes or revisions be made on a drawing?

1 A new drawing must be made that includes the changes.
2 Items should be erased and corrected and then noted in a change or revision block on the drawing.
3 Items should be crossed out once, and then corrected.
4 Changes should be made on the prints, only, and the correction indicated in a separate filing system.

260 In a drawing of a hexagonal bolthead, the distance across the flats is equal to the

1 diameter of the circle inscribed in the hexagon
2 diameter of the circle circumscribing the hexagon
3 diagonal of the square circumscribing the hexagon
4 side of the square circumscribing the hexagon

261 Which diagram is a correct top-view representation of a slotted machine screw?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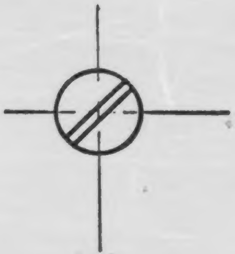
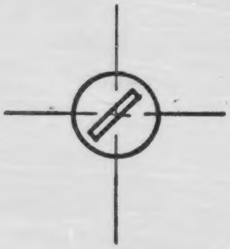

(2)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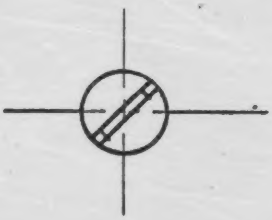

(4)

262 What type of illustrations are working drawings of individual machine parts?

1 detail drawings
2 assembly drawings
3 parts diagrams
4 exploded-view drawings

263 The number of surfaces shown on the side view of a hexagon bolthead should be

(1) 6
(2) 2
(3) 3
(4) 4

264 The radius of the chamfer circle on the top view of a bolt or nut is equal to

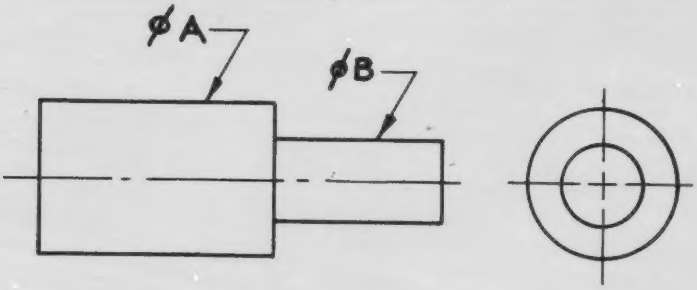
(1) 1 D
(2) 7/8 D
(3) 3/4 D
(4) 2/3 D

Unit E Production Processes (265-279)

265 Sheet steel may be made more rigid by

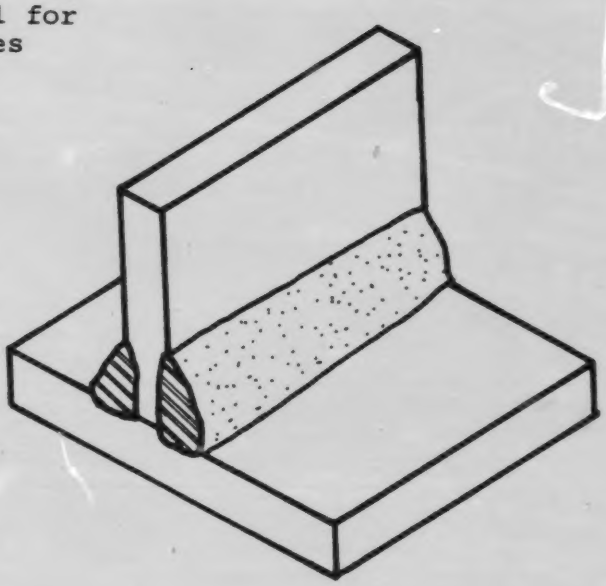
1 notching the corners of the steel sheets
2 shot-peening the steel sheets
3 increasing the temperature during processing
4 scoring the steel sheets

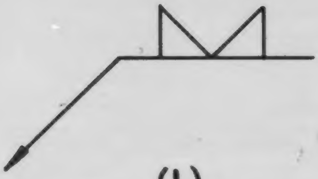
266 What type of instrument should be used to test the concentricity of diameters A and B that are shown in the diagram below?



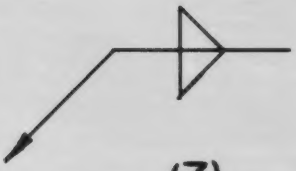
1 feeler gauge
2 dial indicator
3 micrometer
4 vernier caliper

267 Which diagram below is the correct welding symbol for the welded steel plates shown at the right?





(1)



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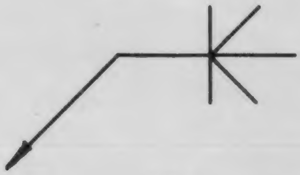
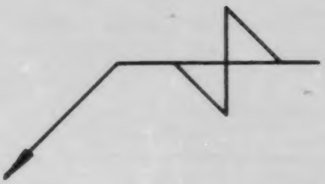


(2)

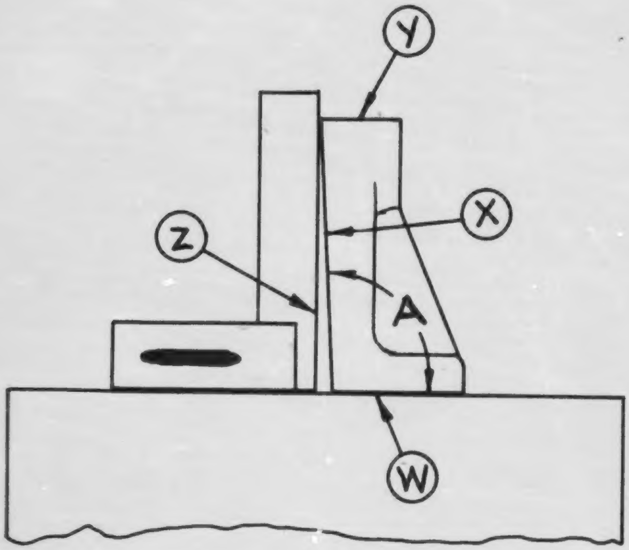


(4)

268 When the notations "carburizing, nitriding, cyaniding" appear on a detail drawing, the part will probably be made from

1 cast iron
2 aluminum
3 brass
4 steel

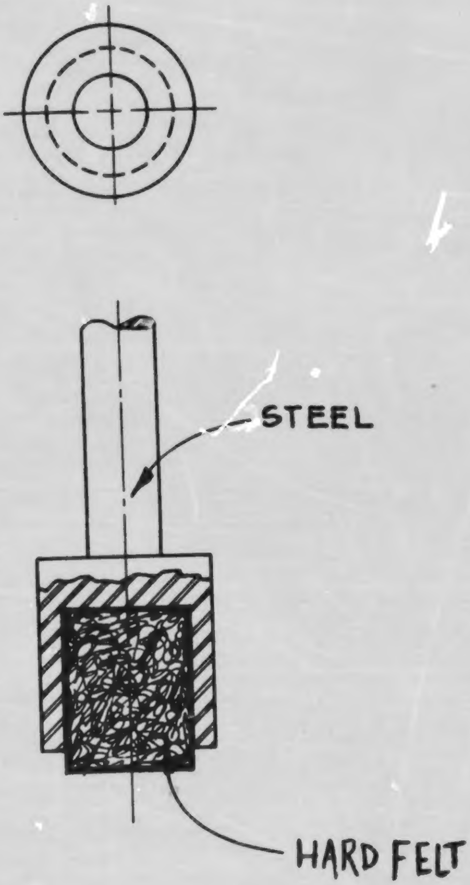
269 The drawing below shows a setup for checking the perpendicularity of angle A. Which arrow indicates the datum surface?



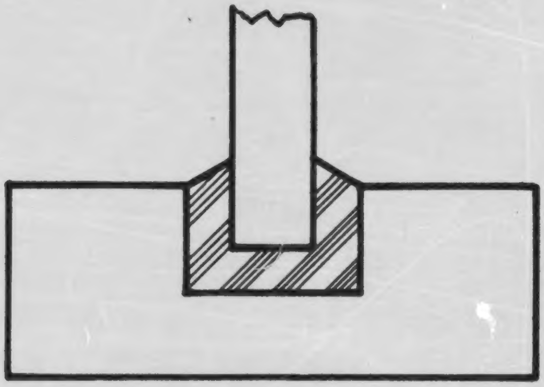
(1) W
(2) X
(3) Y
(4) Z

270 The machine tool shown in the diagram at the right would most likely be used to

1 cut a flat on a cylinder
2 produce a flat surface for a boss
3 hone a cylinder
4 produce a mottled finish



271 By which method have the two parts shown in the diagram below been joined?



1 the use of a mastic
2 an arc weldment
3 a channel-shaped metal fastener
4 an induction weldment

272 Drill points should be drawn at an included angle of

(1) 45° (3) 90°
(2) 60° (4) 120°

273 Which method of machining a hole is a threading operation?

1 countersinking 3 tapping
2 counterboring 4 spot-facing

274 Which characteristic of a thread is measured in a plane that is perpendicular to the axis of the thread?

1 pitch 3 lead
2 depth 4 angle

275 An arc that identifies an inside corner is called a

1 round 3 fillet
2 tangent 4 truss

276 Which type of machined hole is used when a round-head screw must be recessed below the receiving surface?

1 countersink 3 tap
2 counterbore 4 spot-face

277 Welded joints are indicated on a drawing by

1 pictorial representation 3 written specifications
2 graphic symbols 4 toleranced dimensions

278 Finish marks are used on drawings of

1 castings 3 electrical circuits
2 weldings 4 structures

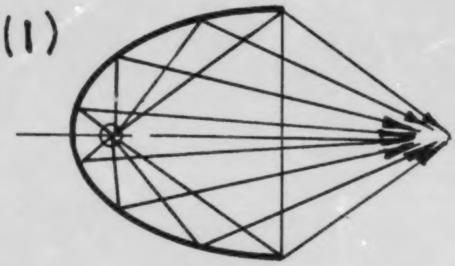
279 The purpose of a key in a keyway is to

1 secure two meshing gears together
2 secure gears to their respective shafts
3 couple two shafts together
4 insure the positive alignment of two shafts

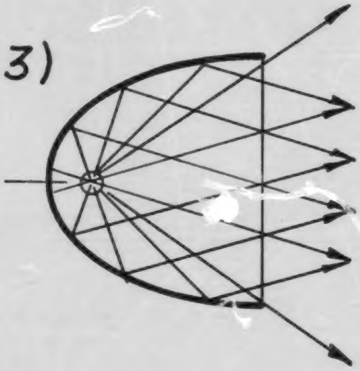
Unit F Design Problems (280-290)

280 The profile of a lamp reflector is in the shape of a semi-ellipse with the filament located at the focus point. Which diagram below best represents the path of the light rays leaving the lamp?

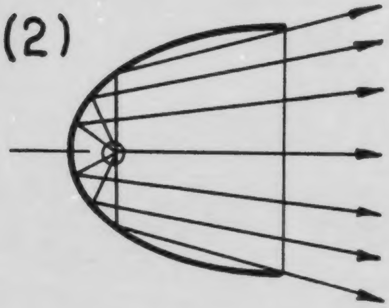
(1)



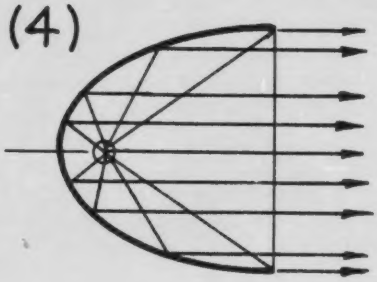
(3)



(2)

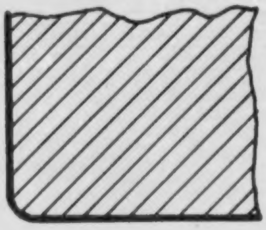


(4)



281 Which forming die diagram below represents the best design for making a 90° bend in heavy-gauge sheet steel?

(1)



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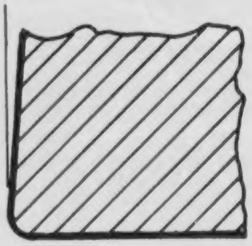

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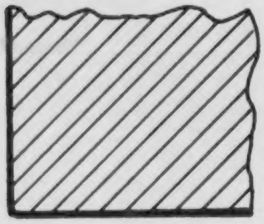

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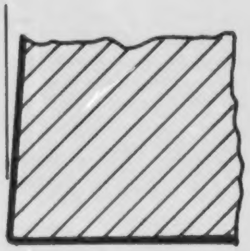
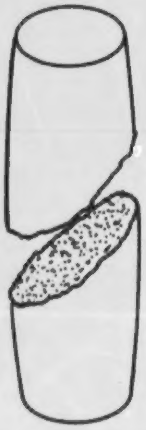


282 The diagram below represents a fractured cylindrical steel specimen. What type of force was most likely responsible for the fracture?



1 torsional force

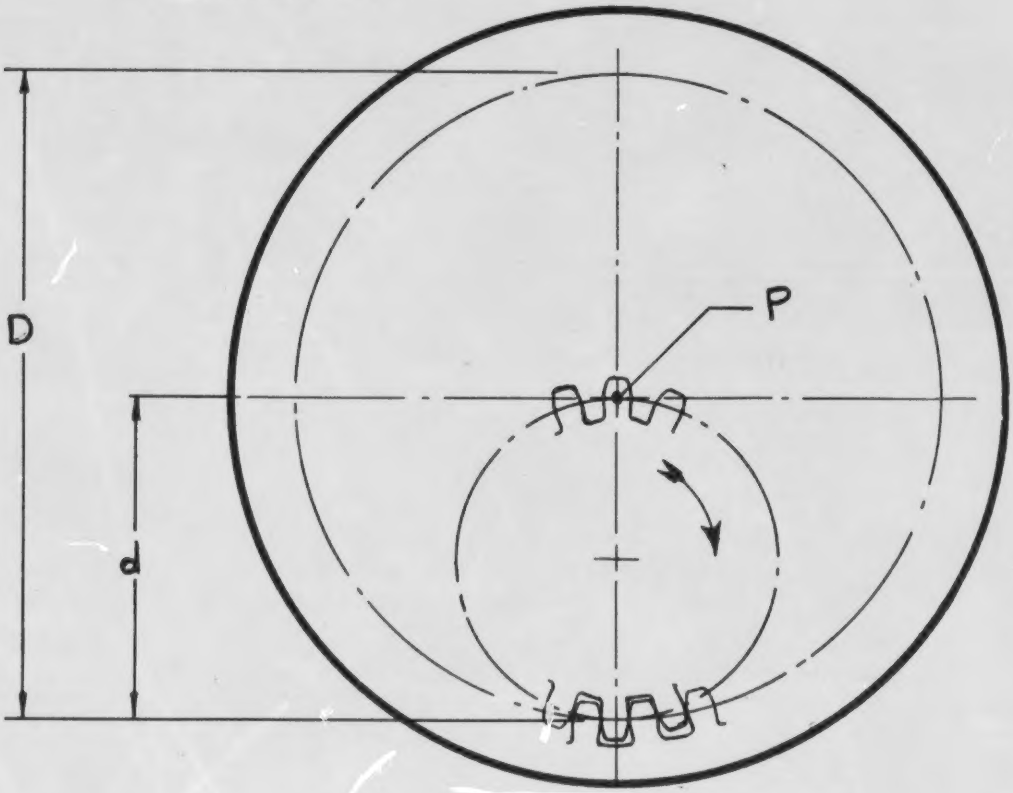
2 shear force

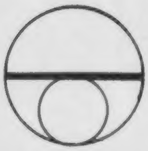
3 compressive force

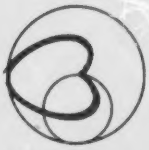
4 tension force

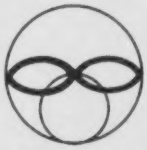
283 In diagram A below, letters D and d are the pitch diameters of mating ring and internal gears. If point P is traced as the internal gear rotates completely around the inside of the ring gear, which diagram below best represents the locus of point P?

DIAGRAM A




(1)


(2)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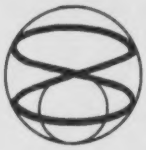
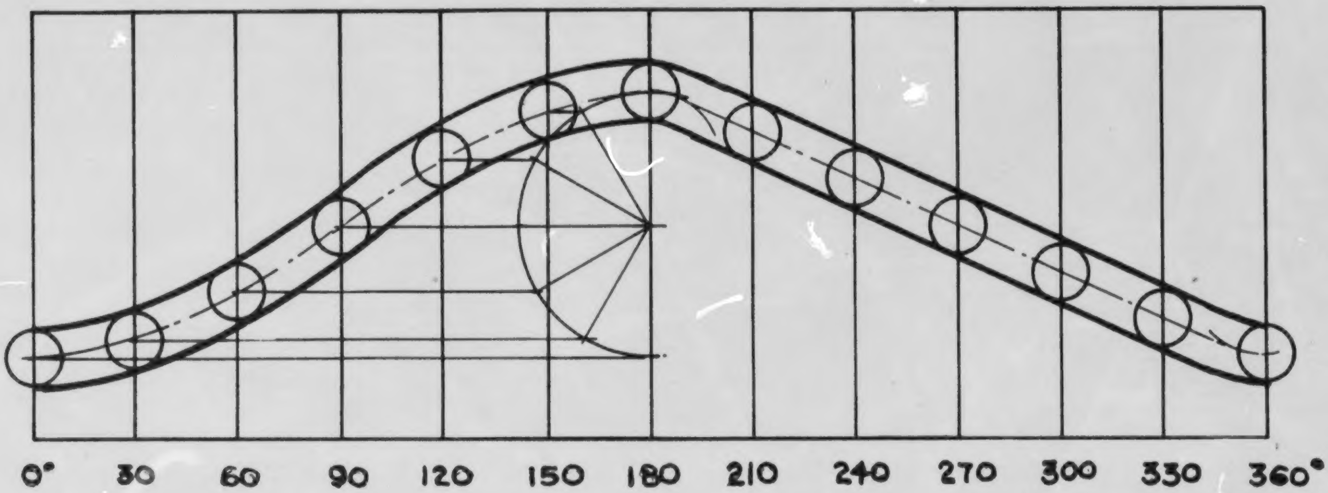

(4)

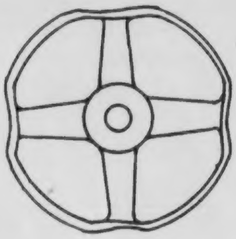
284 The displacement diagram below most likely represents data gathered during the operation of which piece of equipment?



1 a plate cam
2 a cylindrical cam
3 a cooling fan
4 an oil pump

285 The helix curve is a characteristic of a

1 twist drill
2 coil spring
3 crankshaft
4 cylindrical cam



286 The pulley represented by the diagram at the right was produced by casting. The imperfection in the pulley was most likely caused by

1 the fillet radii being too small
2 the rim being too thin in comparison with the spokes
3 an insufficient draft
4 the small number of spokes in the design

287 Which device is fastened to a machine and holds a production part in position?

1 a jig
2 a fixture
3 a die
4 a bushing

288 The purpose of a "C" washer in jig construction is to

1 locate the production in the jig
2 secure a slip bushing to the machine
3 secure the jig to the machine
4 clamp the production in the jig

289 A production hole is to be drilled and then counterbored in a drill jig. Which type of drill bushing should be specified for this drill-jig design?

1 stationary - head type
2 renewable - fixed type
3 removable - slip type
4 liner type

290 Which device is clamped to a production part and guides the various shop tools into position?

1 a jig
2 a fixture
3 a die
4 a bushing

Unit G Industry and Careers (291-298)

291 Which job listed below would most likely be classified as production work?

1 draftsman
2 toolmaker
3 machine operator
4 millwright

292 If a person is a jig designer, then the person is doing

1 skilled work
2 semiskilled work
3 unskilled work
4 production work

293 Most technical illustrators are skilled in drafting and

1 art
2 engineering
3 physics
4 mechanics

294 Which job listed below requires the most knowledge of blueprint reading?

1 production worker
2 industrial salesperson
3 toolmaker
4 machine operator

295 Which trade listed below requires the most knowledge of architectural blueprint reading?

1 machinist
2 millwright
3 machine repairman
4 toolmaker

296 What is the job title of a draftsman who works from sketches and other technical drawings?

1 designer
2 layout draftsman
3 detailer
4 patent draftsman

297 Which job in the mechanical drafting field is an entry-level job?

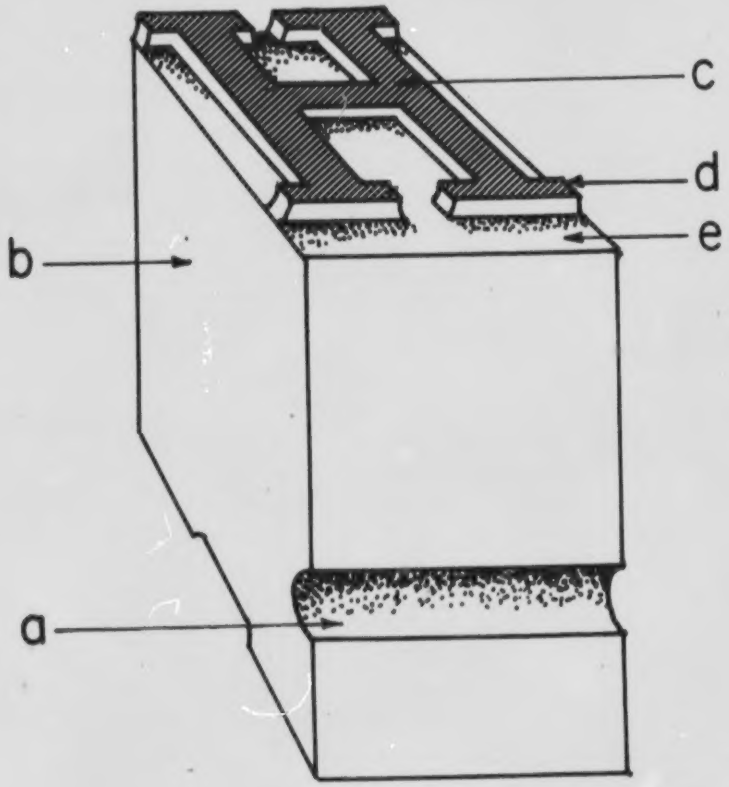
1 detail draftsman
2 layout draftsman
3 checker
4 tracer

298 The assembly line method of production was made practical by the use of

1 conveyor belts
2 interchangeable parts
3 mass production
4 new materials

Group Questions (299-327)

299 A diagram of a piece of type is shown below. On the line at the left of each of parts a through e, write the number of the type part, chosen from the list below, that is indicated by that letter in the diagram. [5]



Type Parts

(1) Groove
(2) Shoulder
(3) Face
(4) Nick
(5) Serif
(6) Body
(7) Feet

______ a

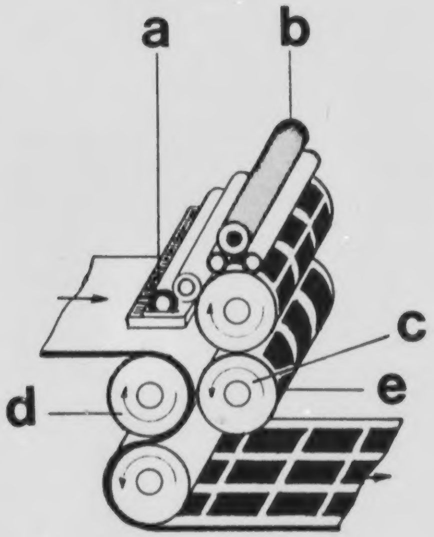
______ b

______ c

______ d

______ e

300 A diagram of an offset lithograph machine is shown below. On the line at the left of each of parts a through e, write the number of the lithograph part, chosen from the list below, that is indicated by that letter in the diagram. [5]



Lithograph Parts

(1) Dampening rollers
(2) Ink rollers
(3) Impression cylinder
(4) Sheet transfer cylinder
(5) Plate cylinder
(6) Rubber blanket
(7) Blanket cylinder

______ a

______ b

______ c

______ d

______ e

301 On the line at the left of each paper type listed in parts a through e, write the number of the basic paper size, chosen from the list below, that is representative of that paper type. (A number may be used more than once.) [5]

Paper Sizes

(1) 17" × 22"
(2) 20" × 26"
(3) 25½" × 30½"
(4) 25" × 38"

______ a Book paper

______ b Bond paper

______ c Cover paper

______ d Index paper

______ e Duplicator paper

302 On the line at the left of each printing method listed in parts a through e, write the number of the printing process, chosen from the list below, that matches that description. (A number may be used more than once.) [5]

Printing Process

(1) Letterpress
(2) Gravure
(3) Screen
(4) Lithography

______ a Prints by relief method

______ b Prints from a flat surface by chemical means

______ c Prints by forcing ink through small openings

______ d Prints with type

______ e Prints with an etched surface

303 On the line at the left of each proofreader's mark in parts a through e, write the number of the word or phrase, chosen from the list below, that matches that symbol. [5]

Phrases

(1) Move to right
(2) Let it stand
(3) Indent paragraph
(4) Insert space
(5) Delete, take out
(6) Wrong style of type

______ a stet

______ b]

______ c ₰

______ d wf//

______ e #

304 On the line at the left of each career title in parts a through e, write the number of the definition, chosen from the list below, that is a function of that job title. [5]

Definitions

(1) Prepares flats
(2) Makes photo-conversions
(3) Produces camera-ready copy
(4) Controls impression
(5) Exposes image carriers
(6) Determines costs

______ a Estimator

______ b Platemaker

______ c Cameraman

______ d Pressman

______ e Artist

305 On the line at the left of each light phenomenon listed in parts a through e, write the number of the phrase, chosen from the list below, that best defines that word. [5]

Definitions

(1) Light waves vibrating in one plane
(2) Light rays returning from a polished surface
(3) Bending of light due to a loss of velocity
(4) Monochromatic light
(5) Light rays returning from a rough surface
(6) Blurring of image

______ a Specular reflection

______ b Diffuse reflection

______ c Aberration

______ d Polarization

______ e Refraction

306 On the line at the left of each manufacturing term in a through e, write the number of the phrase, chosen from the list below, that best defines that term. [5]

Phrases

(1) A type of production where each worker performs a single operation
(2) The procedure of determining the strength and durability of a manufactured product
(3) The procedure of setting up uniform methods for performing a specific job
(4) The process of designing a product so that it can be manufactured on a large scale
(5) The process of preventing defects in the final product
(6) The preparation of special machinery to produce a specific product
(7) A method of production where machines control the manufacturing process

______ a Testing

______ b Automation

______ c Standardization

______ d Product engineering

______ e Quality control

307 On the line at the left of each manufacturing term in a through e, write the number of the phrase, chosen from the list below, that best defines that term. [5]

Phrases

(1) Power equipment on an assembly line
(2) Nonworking representations of a product
(3) Products made from assembly-line materials
(4) A list of materials needed to make a product
(5) The separate components of a product
(6) Detailed plans of a product
(7) A combination of the components of a product

______ a Pilot models

______ b Prototypes

______ c Specifications

______ d Parts

______ e Assemblies

308 On the line at the left of each production term in a through e, write the number of the phrase, chosen from the list below, that best defines that term. [5]

Phrases

(1) A floor plan of the area in which production will take place
(2) A plan showing how materials move from step to step
(3) The process of preparing machinery and equipment for manufacturing
(4) A list of all methods and equipment needed to make the product
(5) All the ideas needed to carry out the efficient manufacture of a product
(6) A representation of the sequence of steps in a product's manufacture
(7) The process of setting up all machines so that they perform properly

______ a Production planning

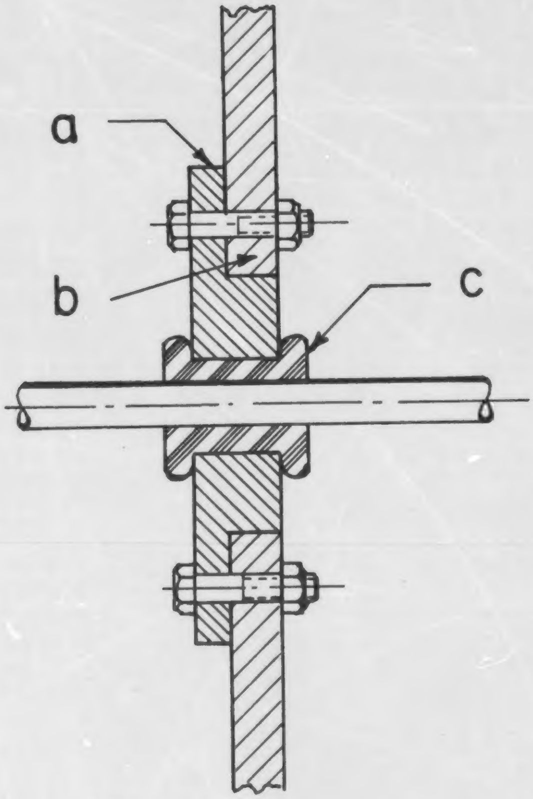
______ b Industrial engineering

______ c Operations breakdown

______ d Plant layout diagram

______ e Materials flow chart

309 For a through c in the diagram below, write in the space provided the name of the part of the support for passing tubing through a metal plate. [3]



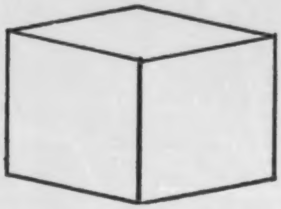
____________ a

____________ b

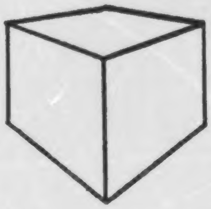
____________ c

310 On the line at the left of the name of each type of pictorial drawing in a through e, write the number of the drawing, chosen from those shown below, which best represents that type of drawing. [Triangles and straightedges may be used in determining your answers.] [5]

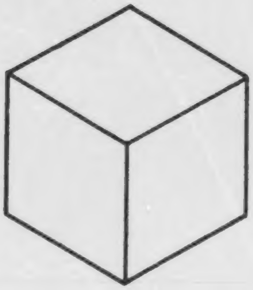
(1)



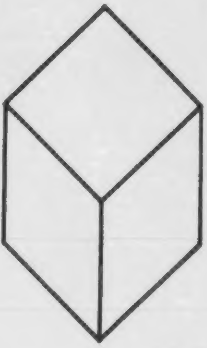
(4)



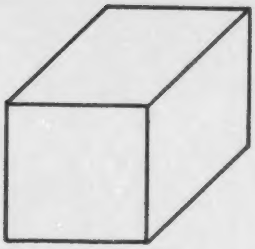
(2)



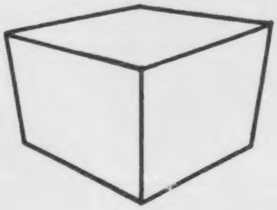
(5)



(3)



(6)



______ a Two-point perspective

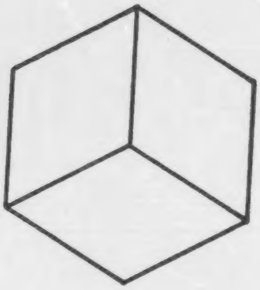
______ b Cavalier oblique

______ c Three-point perspective

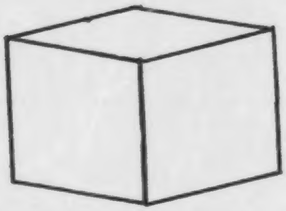
______ d Isometric reversed axis

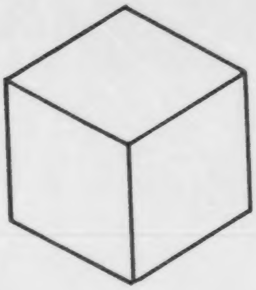
______ e Axonometric pictorial

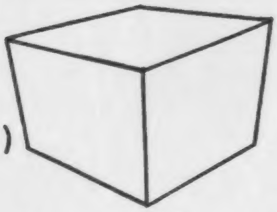
(7)

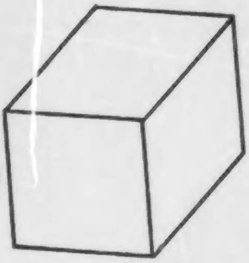


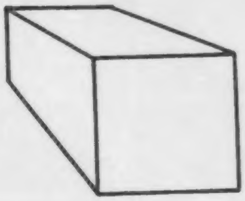
311 On the line at the left of the name of each type of pictorial drawing in a through e, write the number of the drawing, chosen from those shown below, which best represents that type of drawing. [Triangles and straightedges may be used in determining your answers.] [5]

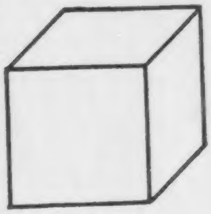

(1)

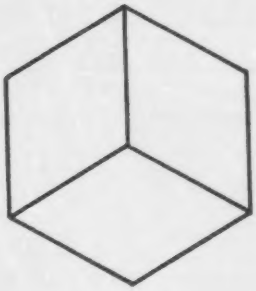

(2)


(3)


(4)


(5)


(6)


(7)

______ a Cabinet oblique

______ b Trimetric

______ c Dimetric

______ d One-point perspective

______ e Isometric

312 On the line at the left of each definition in a through e, write the number of the term, chosen from the list below, that best fits that definition. [5]

Terms

(1) Allowance
(2) Tolerance
(3) Limits
(4) Clearance
(5) Basic size
(6) Nominal size
(7) Interchangeable size
(8) Rounded-off size

______ a The maximum and minimum sizes indicated by a toleranced dimension

______ b The size from which limits of size are derived by the application of allowances and tolerances

______ c The amount by which a dimension may vary

______ d The amount of space between mating parts

______ e The size used for the purpose of general identification

313 Base your answers to a through e on the problem and information below. [5]

A shaft is to fit into a hole with a CLASS LC2 fit. The nominal size is 1½ inches. The following information has been obtained from ASA tables:

Size range in inches: 1.19 - 1.97

Limits of clearance for an LC2 fit: 0 and 1.6

Standard limits for the hole: +1.0 and -0

Standard limits for the shaft: +0 and -0.6

Table uses the basic hole system

Limits are in thousandths of an inch

a What is the limit dimension for the shaft?________________

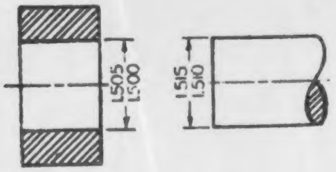
b What is the limit dimension for the hole?________________

c What is the maximum allowance?________________

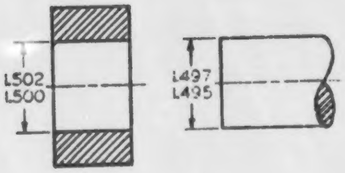
d What is the minimum allowance?________________

e What type of fit will be produced by this design?________

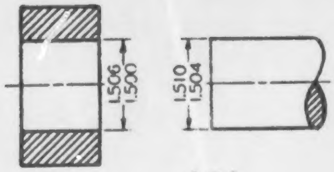
314 Base your answers to a through e on the four drawings shown below. [5]


1.505
1.500
1.515
1.510

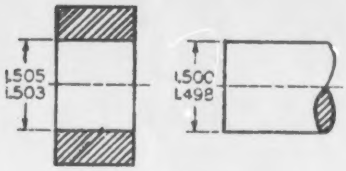
(1)


1.502
1.500
1.497
1.495

(3)


1.506
1.500
1.510
1.504

(2)


1.505
1.503
1.500
1.498

(4)

a Which diagram represents a transition fit?

(1) 1
(2) 2
(3) 3
(4) 4

b Which diagram represents an interference fit?

(1) 1
(2) 2
(3) 3
(4) 4

c Which diagram is dimensioned by a basic shaft system?

(1) 1
(2) 2
(3) 3
(4) 4

d Which diagram indicates a maximum negative allowance of 0.010?

(1) 1
(2) 2
(3) 3
(4) 4

e Which diagram indicates a maximum positive allowance of 0.002?

(1) 1
(2) 2
(3) 3
(4) 4

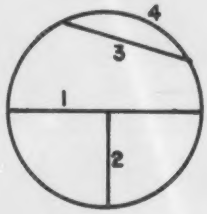
315 For each of parts 1 through 4 of the circle below, write in the space provided the name of the part of the circle that is indicated by that number. [5]

1 ______________________________

2 ______________________________

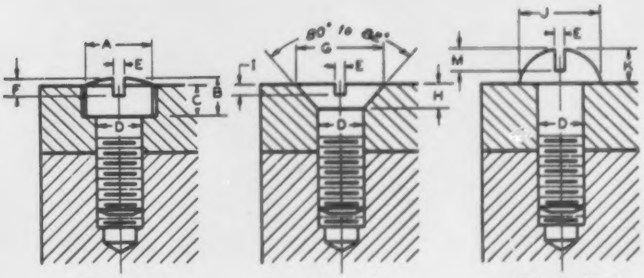
3 ______________________________

4 ______________________________



316 Base your answers to parts a through e on the diagrams and chart below which represent dimensions for slotted-head cap screws. [5]

American Standard Slotted-head Cap Screws



Fillister Head *Flat Head* *Button Head*

Nominal diameter D	A max.	B max.	C max.	E max.	F max.	G max.	H average	I max.	J max.	K max.	M max.
$\frac{1}{4}$	0.375	0.216	0.172	0.075	0.097	0.500	0.140	0.068	0.437	0.191	0.117
$\frac{5}{16}$	0.437	0.253	0.203	0.084	0.115	0.625	0.177	0.086	0.562	0.245	0.151
$\frac{3}{8}$	0.562	0.314	0.250	0.094	0.142	0.750	0.210	0.103	0.625	0.273	0.168
$\frac{7}{16}$	0.625	0.368	0.297	0.094	0.168	0.812	0.210	0.103	0.750	0.328	0.202
$\frac{1}{2}$	0.750	0.413	0.328	0.106	0.193	0.875	0.210	0.103	0.812	0.354	0.218
$\frac{9}{16}$	0.812	0.467	0.375	0.118	0.213	1.000	0.244	0.120	0.937	0.409	0.252
$\frac{5}{8}$	0.875	0.521	0.422	0.133	0.239	1.125	0.281	0.137	1.000	0.437	0.270
$\frac{3}{4}$	1.000	0.612	0.500	0.149	0.283	1.375	0.352	0.171	1.250	0.546	0.338
$\frac{7}{8}$	1.125	0.720	0.594	0.167	0.334	1.625	0.423	0.206			
1	1.312	0.803	0.656	0.188	0.371	1.875	0.494	0.240			
$1\frac{1}{8}$	....	....	....	0.196	....	2.062	0.529	0.257			
$1\frac{1}{4}$	....	....	....	0.211	....	2.312	0.600	0.291			
$1\frac{3}{8}$	....	....	....	0.226	....	2.562	0.665	0.326			
$1\frac{1}{2}$	....	....	....	0.258	....	2.812	0.742	0.360			

a What is the height of the head (K) of a button-head screw with a diameter of 1/4 inch?____________________

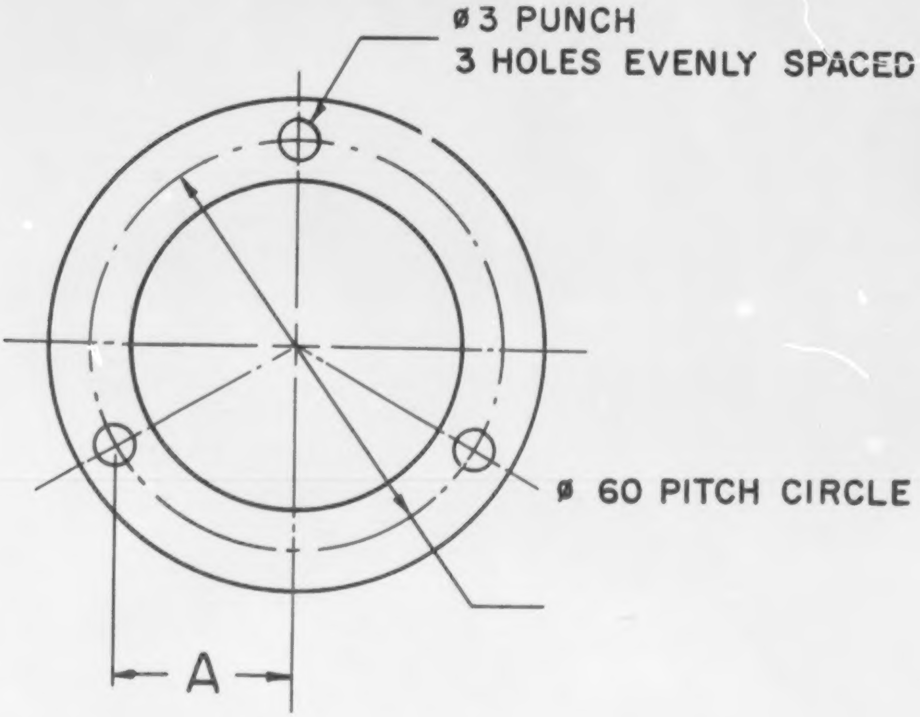
b What is the depth a flat-head screw should be countersunk (H) if it has a diameter of 3/4 inch?____________________

c What is the width (E) of a fillister-head slot screw with a diameter of 7/16 inch?____________________

d If the height of a fillister-head screw is 0.253 (B), what is the diameter of its head?____________________

e A flat-head screw has a head diameter of 0.750 (G). What is its nominal diameter?____________________

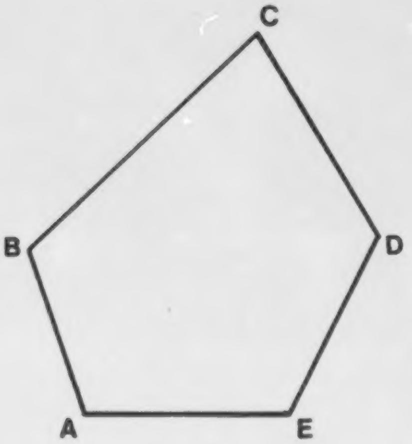
317 The holes in the gasket shown in the diagram are to be located by the coordinate method of dimensioning. By calculation, determine the length of dimension A to two decimal places. The answer should be in millimeters. [Note: Requires use of trig tables.] [3]



Note that group questions (318-327) require the student to use drawing paper and the appropriate drafting tools.

318 Construct a diagonal measuring scale to read kilometers, 1/10 kilometer, 1/100 kilometer. The scale should read up to 5 kilometers in length. Use a scale of 1 kilometer = 40 millimeters. Mark off the measurement 3.67 kilometers on the completed scale. [5]

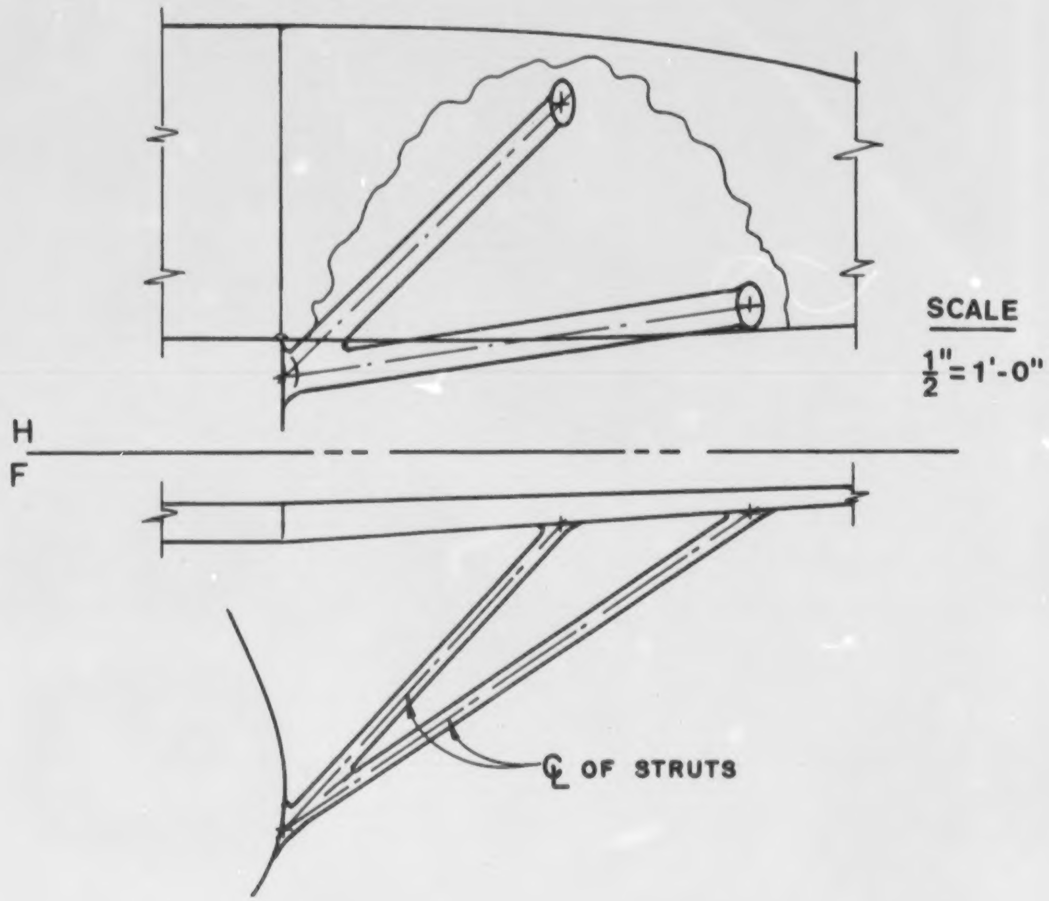
319 By construction, increase the area of metal plate ABCDE by 2/3. Do not change the shape of the plate. [5]



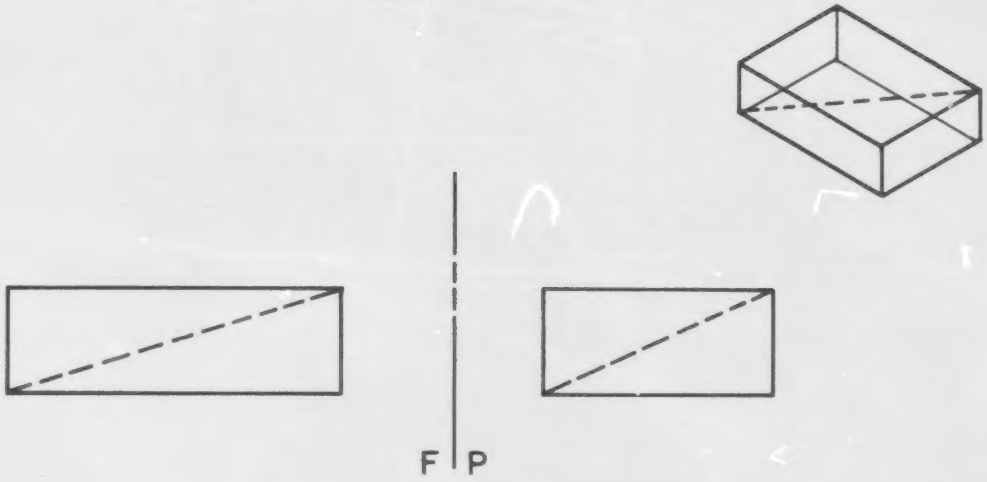
320 Construct adjacent scales to read "Miles Per Hour" and "Kilometers Per Hour." Base your construction on the approximate equivalent of 62 miles equals 100 kilometers. Use a scale of 10 miles = 20 millimeters. [5]

321 On the diagram below, determine each of the following by the revolution method. [5]

- a The true length of the wing struts measured along their centerlines
- b The slope angle of each wing strut measured to the nearest degree



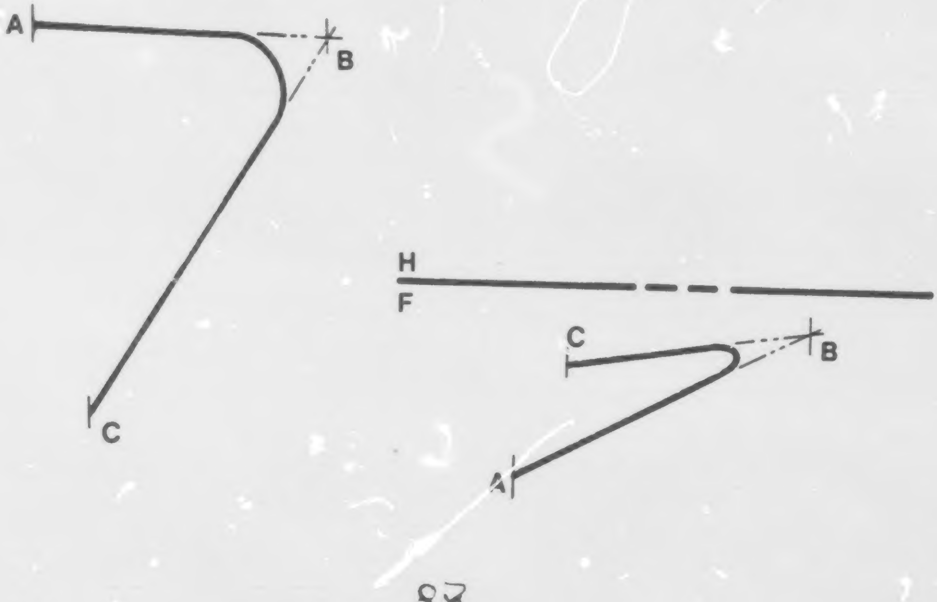
322 A rectangular prism is shown below. Determine the true length of the diagonal. [3]



323 Construct a diagram of a parabolic reflector of a small reading lamp that meets the following specifications: [5]

- a Lamp filament located at focus point of parabola
- b Vertex located 10 millimeters from focus point
- c Opening of the reflector is 94 millimeters

324 The rod A-C is bent at B to a true radius of 12 millimeters. Locate, by the secondary auxiliary method, the beginning and end-points of the bend. Label these points M and N in all views. [5]

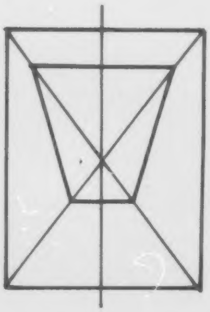


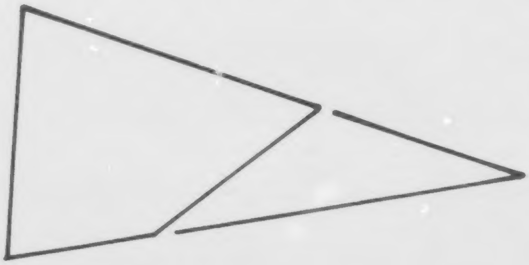
325 Construct a bar chart that represents the comparative surface textures produced by the metal-shaping processes listed below. [3]

Processes	Micrometers
Flame cutting	25
Snagging	12.5
Shaping	6.30
Drilling	3.20
Broaching	1.60
Reaming	1.60
Electrochemical	0.80
Barrel burnishing	0.40
Grinding	0.20
Lapping	0.10

326 Divide the given rectangle into 8 equal parts using the parallel-line method. [5]

327 Draw the right side and auxiliary view showing the true size of the top surface. Develop the truncated pyramid. [5]





Industrial Arts Examination Materials

GRAPHICS TECHNOLOGY

Scoring Key

Multiple-Choice Questions

(1)	2	(31)	4	(61)	1	(91)	4	(121)	4
(2)	2	(32)	4	(62)	1	(92)	1	(122)	2
(3)	3	(33)	4	(63)	1	(93)	3	(123)	2
(4)	4	(34)	3	(64)	4	(94)	3	(124)	4
(5)	4	(35)	3	(65)	3	(95)	2	(125)	4
(6)	3	(36)	1	(66)	4	(96)	4	(126)	4
(7)	4	(37)	3	(67)	2	(97)	2	(127)	1
(8)	4	(38)	2	(68)	2	(98)	1	(128)	2
(9)	3	(39)	3	(69)	4	(99)	3	(129)	2
(10)	2	(40)	3	(70)	1	(100)	4	(130)	3
(11)	1	(41)	1	(71)	3	(101)	4	(131)	4
(12)	4	(42)	2	(72)	4	(102)	3	(132)	2
(13)	4	(43)	1	(73)	2	(103)	3	(133)	3
(14)	3	(44)	3	(74)	4	(104)	4	(134)	1
(15)	3	(45)	2	(75)	4	(105)	1	(135)	4
(16)	1	(46)	2	(76)	3	(106)	3	(136)	3
(17)	4	(47)	3	(77)	4	(107)	2	(137)	2
(18)	3	(48)	2	(78)	2	(108)	3	(138)	1
(19)	3	(49)	1	(79)	2	(109)	2	(139)	3
(20)	1	(50)	3	(80)	4	(110)	1	(140)	2
(21)	3	(51)	1	(81)	1	(111)	2	(141)	1
(22)	1	(52)	1	(82)	2	(112)	2	(142)	3
(23)	1	(53)	3	(83)	1	(113)	3	(143)	4
(24)	2	(54)	4	(84)	4	(114)	1	(144)	4
(25)	2	(55)	1	(85)	2	(115)	3	(145)	3
(26)	2	(56)	1	(86)	3	(116)	1	(146)	3
(27)	2	(57)	3	(87)	1	(117)	2	(147)	3
(28)	3	(58)	3	(88)	3	(118)	2	(148)	1
(29)	4	(59)	1	(89)	1	(119)	4	(149)	2
(30)	2	(60)	4	(90)	4	(120)	1	(150)	4

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c 3
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e 2

(300)
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c 5
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(301)
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b 1
c 2
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(302)
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b 4
c 3
d 1
e 2

(303)
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b 1
c 5
d 6
e 4

(304)
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b 5
c 2
d 4
e 3

(305)
a 2
b 5
c 6
d 1
e 3

(306)
a 2
b 7
c 3
d 4
e 5

(307)
a 2
b 3
c 6
d 5
e 7

(308)
a 5
b 3
c 4
d 1
e 6

(309)
a Blank off plate
b Bulkhead
c Grommet

(310)
a 6
b 4
c 1
d 5
e 2

(311) a 4
b 3
c 6
d 7
e 2

(312) a 3
b 5
c 2
d 1
e 6

(313) a 1.5000 + 0.0000
1.4994 - 0.0006
b 1.5010 + 0.0010
1.5000 - 0.0000
c 0.0016
d 0.0000
e Clearance

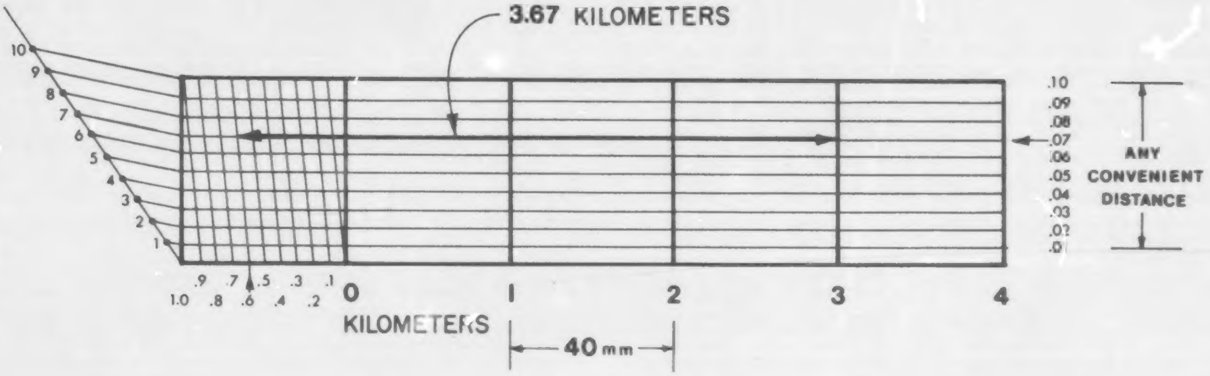
(314) a 2
b 1
c 4
d 2
e 2

(315) 1 **Diameter**
2 **Radius**
3 **Chord**
4 **Arc**

(316) a 0.191
b 0.352
c 0.094
d 0.437
e 3/8

(317) 25.98 mm

(318)


3.67 KILOMETERS
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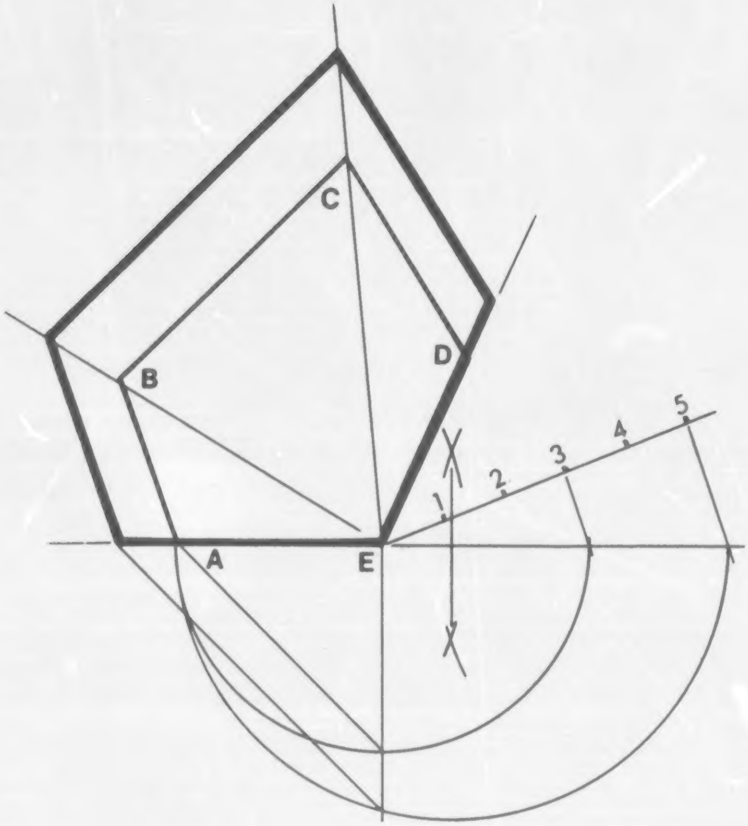
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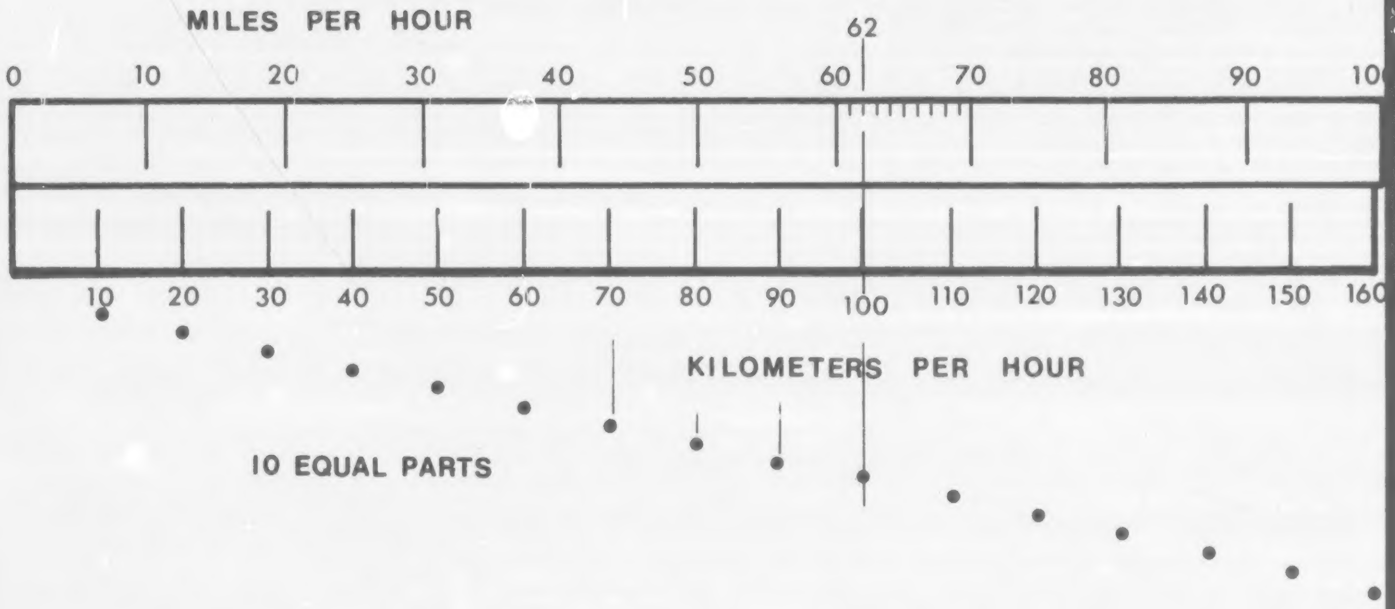
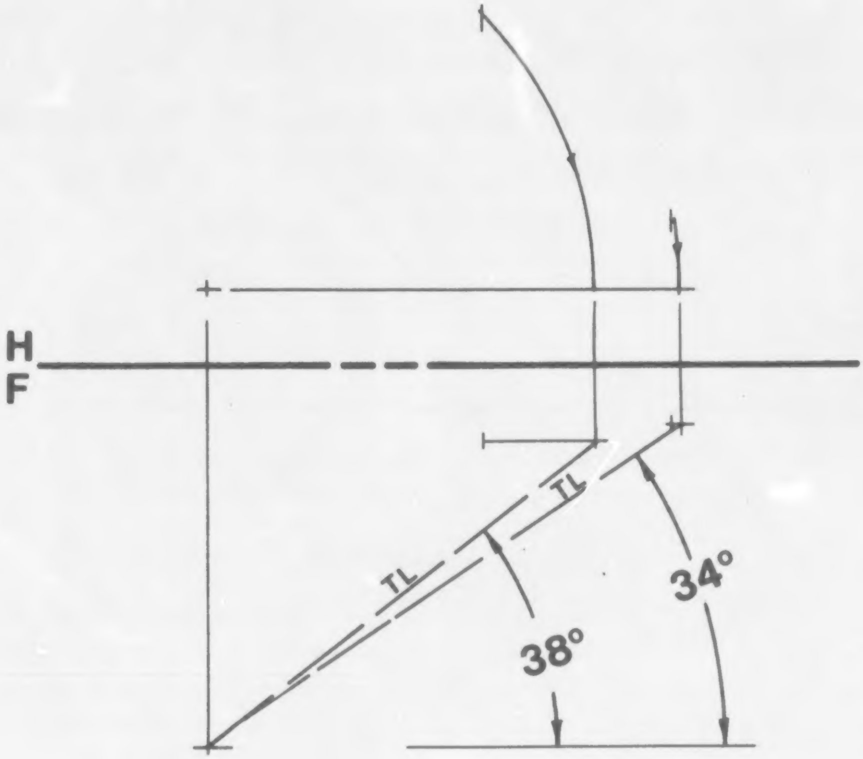

MILES PER HOUR
KILOMETERS PER HOUR
10 EQUAL PARTS

(321)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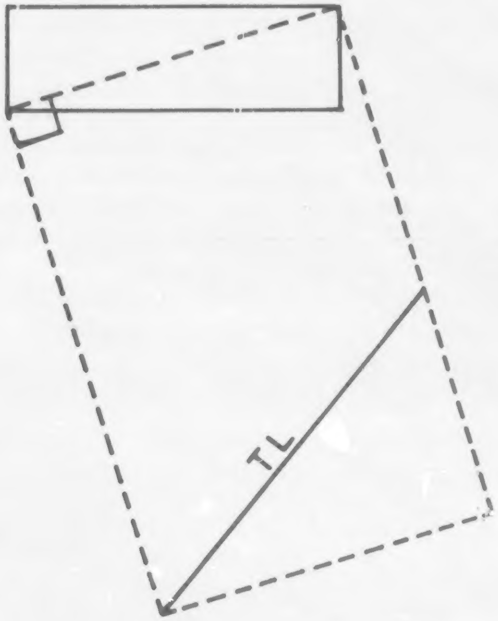

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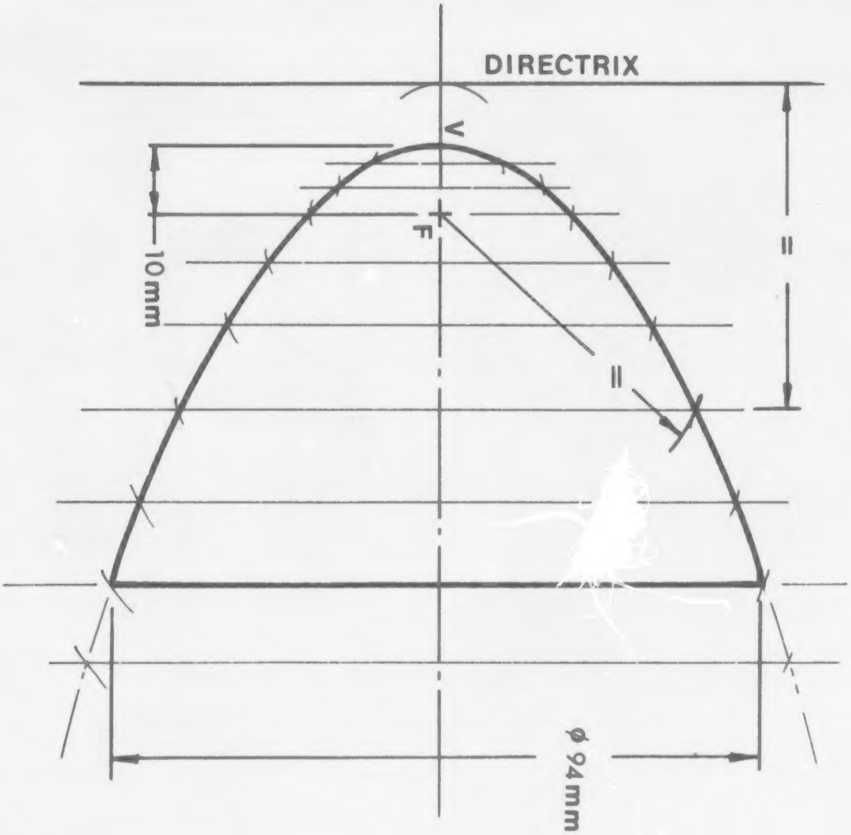
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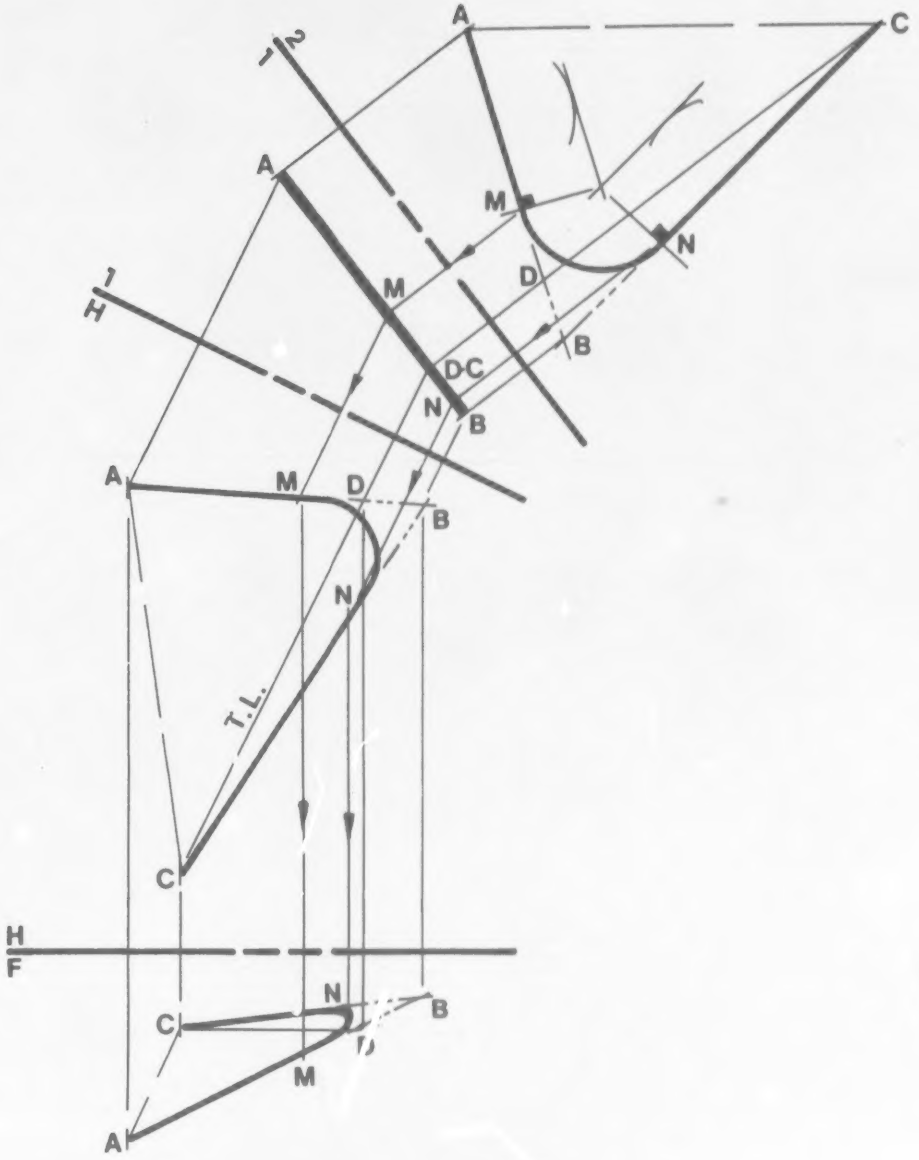
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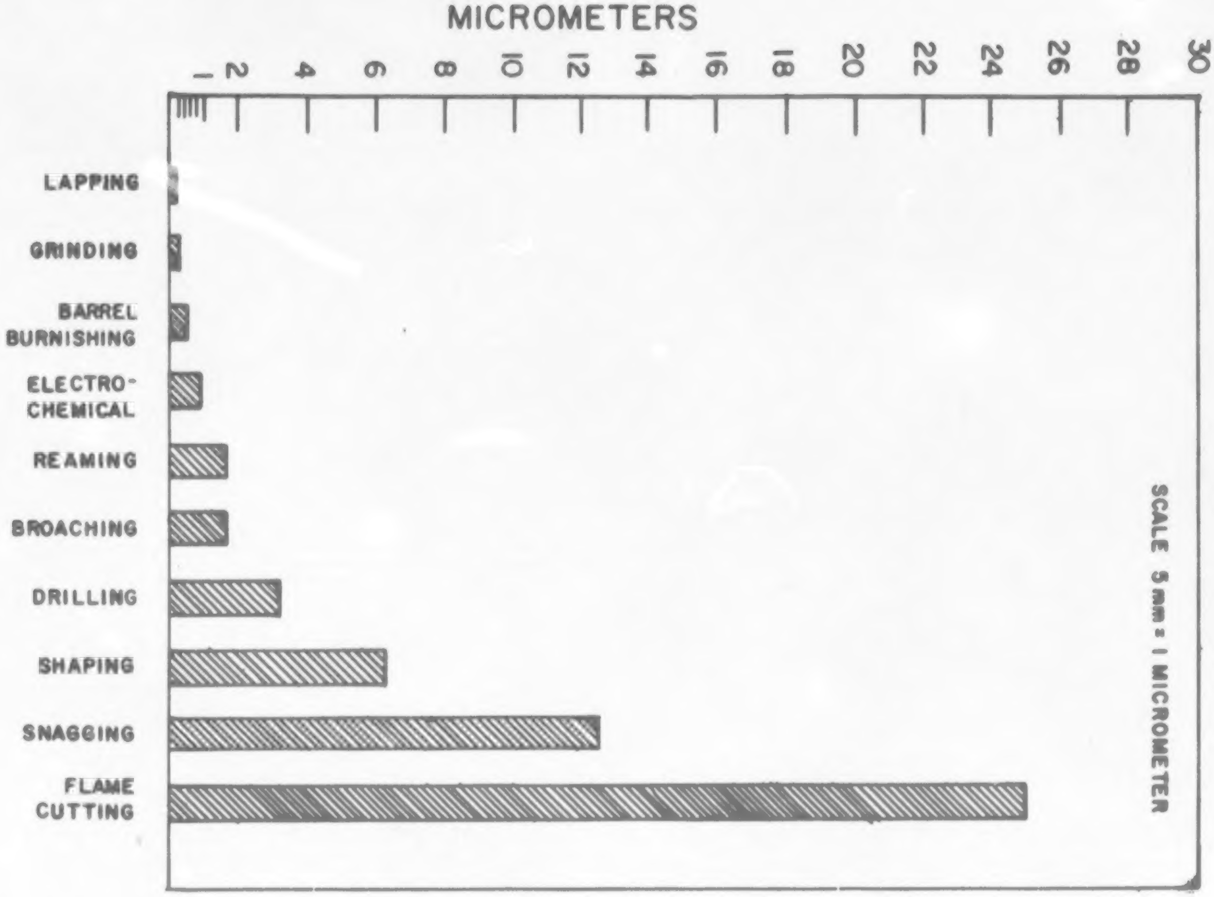
MICROMETERS
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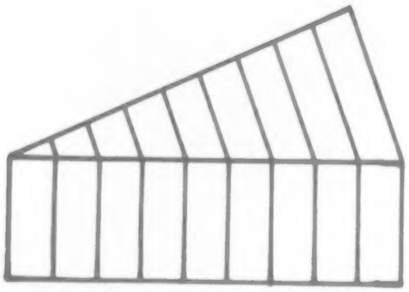
LAPPING
GRINDING
BARREL BURNISHING
ELECTRO-CHEMICAL
REAMING
BROACHING
DRILLING
SHAPING
SNAGGING
FLAME CUTTING
SCALE 5mm = 1 MICROMETER

(326)



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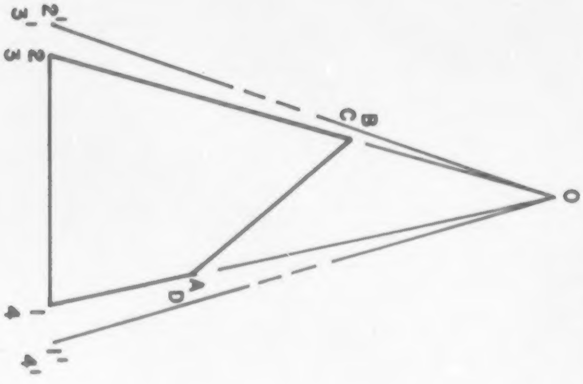
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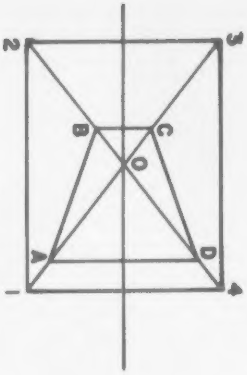

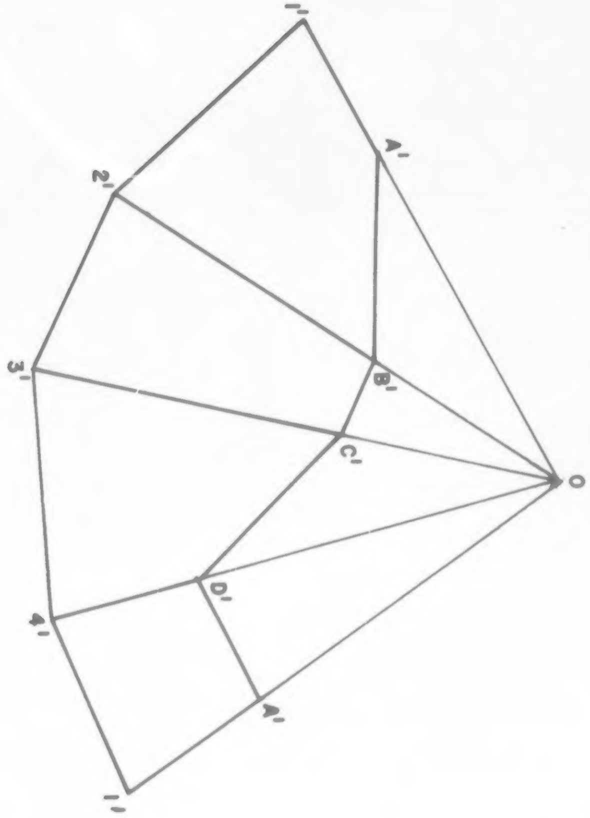
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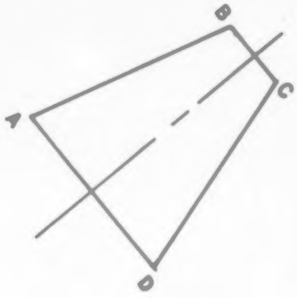
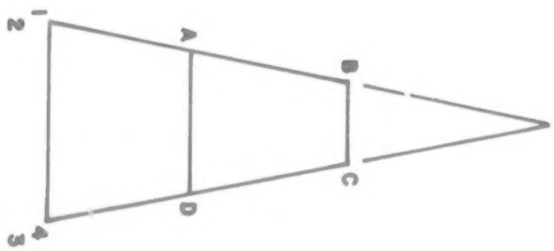




Industrial Arts Examination Materials

POWER TECHNOLOGY

Directions (1-290): On your answer paper write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Transportation

Unit A Vehicles (1-13)

1 The front part of a boat is called the

1 port
2 bow
3 starbord
4 stern

2 What type of boat hull is designed to lift partially out of the water as the boat gains speed?

1 displacement
2 fast
3 planing
4 sport

3 Which city had the automobile factories for Hudson, EMF, and Chandler?

1 San Francisco
2 Cleveland
3 New York
4 Detroit

4 What fuel was used in the first automobile powered by an internal-combustion engine?

1 gasoline
2 kerosene
3 lighting gas
4 fuel oil

5 Compared with vehicles that have gasoline engines, electric vehicles have a

1 higher starting torque
2 greater top speed
3 lower fuel consumption
4 higher power-to-weight ratio

6 The major problem of modern steam-powered automobiles is that

1 they are very heavy
2 the engine sometimes explodes
3 they are difficult to start and operate
4 the engine is very complex and difficult to repair

7 Why do external-combustion engines produce less pollution than internal-combustion engines?

1 They have fewer moving parts.
2 They require fewer tuneups.
3 The combustion process takes place at atmospheric pressure.
4 The combustion process requires cleaner fuel.

8 Compared with a diesel engine, the main advantage of a conventional gasoline engine is that it

1 uses less fuel
2 can develop more power
3 is lighter
4 uses a cheaper fuel

9 Which engine has the greatest overall efficiency for vehicle use?

1 steam (piston)
2 gasoline engine
3 diesel engine
4 rotary-combustion engine

10 Which engine is a moderately successful hybrid from the aspect of emissions control?

1 Sterling engine
2 free piston engine
3 gas-electric engine
4 Freon 11 vapor engine

11 The major problem with gas turbine vehicles is

1 a lack of efficiency
2 slow acceleration
3 a very heavy engine
4 a difficult startup

12 The two most important ideas that early automobile inventors and manufacturers developed were

1 safety and profit
2 quantity and quality
3 interchangeability of parts and mass production
4 interchangeability of parts and quality control

13 The first successful flight in a powered aircraft was credited to

1 Amelia Earhart
2 Eddie Rickenbacker
3 Orville Wright
4 Charles Lindbergh

Unit B Machines and Power Transportation (14-26)

14 Mechanical power is the term used to describe the transmission and control of motion through the use of

1 gears, wheels, and shafts
2 gears, pulleys, and shafts
3 belts, pulleys, and shafts
4 belts, gears, and shafts

15 What mechanical power device provides for all four major control functions?

1 a pulley and belt
2 a gear
3 a wheel and axle
4 a chain and sprocket

16 What class of lever is a pair of pliers?

1 first class
2 second class
3 third class
4 fourth class

17 The most useful form of mechanical motion is

1 reciprocating
2 rotary
3 linear
4 random

18 What is the gear ratio when the driving gear has 20 teeth and the driven gear has 50?

(1) 1 to 2.5
(2) 2.0 to 5
(3) 2.5 to 1
(4) 5 to 2.0

19 The increase in the speed of an object is called

1 acceleration
2 velocity
3 momentum
4 inertia

20 The tendency of an object at rest to remain at rest and an object in motion to remain in motion is called

1 acceleration
2 velocity
3 inertia
4 torque

21 The efficiency of a machine may be determined by dividing the

1 work input by the work output
2 work output by the work input
3 work done by the power developed
4 power developed by the work done

22 What is the term for the relationship between input and output force?

1	mechanical advantage	3	deceleration-acceleration
2	theoretical force	4	speed-velocity

23 The lever, wheel and axle, pulley, inclined plane, wedge, and screw are all examples of

1	energy converters	3	simple machines
2	work multipliers	4	reciprocating machines

24 What is the term for the power loss which occurs when one surface rubs against another?

1	pressure loss	3	lubrication
2	brake horsepower	4	friction

25 Three types of input motion are

1 reciprocating, cranking, and back and forth
2 back and forth, up and down, and cranking
3 reciprocating, rotary, and linear
4 linear, rotary, and back and forth

26 The function of gears is to

1 change rotary motion to reciprocating motion
2 provide an increase in power
3 provide a change in direction, speed, or force
4 change acceleration into momentum

Unit C Small Engines (27-50)

27 The purpose of the pin in each ring groove of a two-cycle engine is to prevent

1 the ring from turning
2 gum formation in the ring groove
3 ring breakage
4 oil from seeping past the rings

28 What is the approximate temperature created by burning fuel in an internal-combustion engine under normal conditions?

(1) 2,500 degrees
(2) 3,500 degrees
(3) 4,500 degrees
(4) 5,500 degrees

29 A magneto is a self-contained

1 battery
2 starting unit
3 generating unit
4 lighting unit

30 The purpose of the venturi in a carburetor is to

1 create a partial vacuum
2 provide a vent for the fuel
3 provide a 14-to-1 air ratio
4 create air pressure for the cylinder

31 A device used to check the power output of an engine is the

1 denominator
2 dynamometer
3 thermactor
4 thrust brake

32 What is the term for the width or diameter of an engine cylinder?

1 stroke
2 displacement
3 cycle
4 bore

33 The heat-radiating surface of an air-cooled engine is increased by devices called

1 shrouds
2 fan blades
3 radiators
4 fins

34 Each movement of the piston from top to bottom, or from bottom to top, is called a

1 cycle
2 stroke
3 thrust
4 throw

35 The electrolyte in a fully charged battery should have a specific gravity of

(1) 1.110 (3) 1.270
(2) 1.175 (4) 1.400

36 Which internal-combustion piston engine is the simplest mechanically and the most complicated thermodynamically?

(1) 4-stroke cycle (spark) (3) RC Wankel
(2) 2-stroke cycle (spark) (4) 4-stroke cycle (diesel)

37 A small diesel engine weighs about

(1) 250 lb/hp (3) 50 lb/hp
(2) 100 lb/hp (4) 7 lb/hp

38 In the four-stroke cycle of an internal-combustion piston engine, the term "valve overlap" refers to the

1 time between when the piston reaches TDC and when the intake valve closes
2 time between when the piston reaches TDC and when the exhaust valve closes
3 a period in degrees of crankshaft rotation in which both intake and exhaust valves are open
4 a period in degrees of crankshaft rotation in which both intake and exhaust valves are closed

39 Which formula is used to determine the compression ratio of an internal-combustion piston engine?

1 $\frac{\text{cylinder displacement}}{\text{clearance volume}}$

2 $\frac{\text{clearance volume}}{\text{cylinder displacement}}$

3 $\frac{\text{clearance volume}}{\text{clearance volume and cylinder displacement}}$

4 $\frac{\text{cylinder displacement and clearance volume}}{\text{clearance volume}}$

40 Which formula is used to determine the cylinder displacement of an internal-combustion piston engine?

(1) $\pi r^2 h$ (3) bore × stroke × 3.1416

(2) $\frac{1}{2}\pi Dh$ (4) πDh

41 In an engine, the term "stroke" refers to the time between the

1 successive firings of a spark plug
2 diameter of a cylinder
3 movement of a piston between TDC and BDC
4 length of a connecting rod

42 The scale used for rating a diesel engine's burning efficiency is called

1 heptane scale
2 octane scale
3 cetane scale
4 research scale

43 For the intake and exhaust of gases, a two-stroke-cycle diesel engine contains

1 intake and exhaust ports
2 intake ports and exhaust valves
3 intake and exhaust valves
4 intake valves and exhaust ports

44 Which peaks first during a dynamic analysis of an internal-combustion engine?

1 horsepower
2 torque
3 rpm
4 oil pressure

45 The RC Wankel engine and a two-stroke-cycle engine are alike in that they both

1 use ports
2 use expansion chamber exhaust systems
3 contain several cylinders
4 contain intake and exhaust valves

46 What is the sequence of energy transformations in the internal-combustion piston engine?

1 chemical → mechanical → thermal
2 thermal → chemical → mechanical
3 mechanical → thermal → chemical
4 chemical → thermal → mechanical

47 Which of the following is a part of a magneto-type ignition system?

1 generator
2 condenser
3 battery
4 alternator

48 What part is usually found on large-engine carburetors, but not usually found on small-engine carburetors?

1 an acceleration pump
2 a fuel bowl
3 a throttle plate
4 a manual choke

49 In comparison with four-stroke engines, the greatest disadvantage of a two-stroke engine is that the

1 frictional losses are higher
2 incoming fuel and air mixes with the outgoing exhaust
3 gas and oil must be mixed together
4 operating temperature is higher

50 The excessively rapid burning of the compressed fuel-air mixture that causes knocking is called

1 detonation
2 backfiring
3 combustion
4 compression

Unit D Vehicle Engines (51-79)

51 In comparison with a conventional piston engine, the main advantage of the RC Wankel engine is that it

1 produces less pollution
2 has fewer parts
3 is easier to repair
4 has greater compression

52 The Wankel rotary engine is quieter than most engines because it has

1 an insulated shrouding
2 thick engine mounts
3 no reciprocating parts
4 high operating rpm

53 When gasoline enters the air stream in the carburetor throat, it is

1 burned
2 purified
3 decomposed
4 vaporized

54 What device forces air into the cylinders of a two-cycle diesel engine?

1 nozzle
2 intake valve
3 injector
4 blower

55 In the Wankel rotary engine, the output shaft makes three turns while the rotor turns

(1) 1 revolution (3) 3 revolutions
(2) 9 revolutions (4) 6 revolutions

56 What is the highest compression ratio used in a diesel engine?

(1) 5 to 1 (3) 18 to 1
(2) 11 to 1 (4) 24 to 1

57 Liquid petroleum gas is a mixture of

1 benzol and heptane 3 butane and heptane
2 butane and propane 4 heptane and cetane

58 Which type of diesel engine combustion chamber has the ability to operate on a wide variety of fuels?

1 open combustion chamber 3 turbulence chamber
2 precombustion chamber 4 energy cell

59 In an engine, sludge is a mixture of

1 water, gum, and varnish 3 dirt, gum, and oil
2 gum, varnish, and metal 4 water, oil, and dirt

60 What API designation is required for motor oils approved for use in 1972 and newer cars?

(1) SE (3) SC
(2) CC (4) CD

61 What is the shape of the rotor used in the Wankel engine?

1 round 3 square
2 triangular 4 elliptical

62 What percentage of the total volume of the available cooling air usually is directed to the cylinder head of an air-cooled engine?

(1) 20% (3) 60%
(2) 40% (4) 80%

63 When water freezes, it expands by approximately

(1) 12% (3) 6%
(2) 9% (4) 4%

64 What fraction of the heat energy produced in an engine by the burning fuel must be removed by the cooling system?

(1) $\frac{1}{2}$
(2) $\frac{1}{3}$
(3) $\frac{1}{4}$
(4) $\frac{1}{5}$

65 Why does the cooling system of an internal-combustion engine normally operate at a higher pressure than atmospheric pressure?

1 to prevent the coolant from freezing during the winter
2 to increase the boiling point of the coolant
3 to decrease the boiling point of the coolant
4 to keep the coolant from decomposing

66 An example of the grading system commonly used for engine lubricating oils is 10W-40. In this system, the 10W represents the oil's

1 weight
2 specific gravity
3 viscosity
4 antifriction coefficient

67 Two knock-rating methods commonly used at refineries for gasoline are the

1 cetane and octane methods
2 research and cetane methods
3 motor and octane methods
4 motor and research methods

68 Which type of engine has an operational sequence of events most similar to that of the gas turbine engine?

1 internal-combustion piston engine
2 steam engine
3 Sterling engine
4 electric motor

69 A steam or vapor engine is classified as

1 an internal-combustion engine
2 a rotary-combustion engine
3 an external-combustion engine
4 a linear-expansion engine

70 A hybrid vehicle is a vehicle powered by a

1 rotary engine
2 regular eight-cylinder engine
3 six-cylinder engine with a supercharger
4 combination of energy systems

71 In an internal-combustion piston engine, the torque is the

1 greatest at the low rpm range
2 greatest in the middle rpm range
3 greatest at the high rpm range
4 same throughout the entire rpm range

72 In a steam engine, the torque is the

1 greatest at the low rpm range
2 greatest at the middle rpm range
3 greatest at the high rpm range
4 same throughout the entire rpm range

73 In order to maintain good heat transfer in a cooling system, the coolant must be kept as free as possible from contaminants such as

1 rust and sulphur
2 sulphur and chalk
3 rust and lime
4 lime and sulphur

74 The compressed air and fuel mixture in a diesel engine will ignite when it reaches a minimum temperature of approximately

(1) 500 to 700°F
(2) 1,000 to 1,200°F
(3) 1,400 to 1,600°F
(4) 1,800 to 2,000°F

75 A turbine consists of an inclined plane mounted on a rotating shaft. The shaft must be located in line with the

1 path of fluid force
2 direction of piston travel
3 path of the front wheels
4 direction of torque

76 Methyl alcohol (methanol) produces less Btu's per pound than gasoline. Why does methanol produce more power than gasoline in an engine cylinder?

1 It has a higher heat of vaporization.
2 It has a lower heat of vaporization.
3 It burns faster.
4 It is mixed with less air in the carburetor.

77 What change occurs in atmospheric emissions when a carburetor is adjusted from rich to lean?

1 an increase in hydrocarbons, carbon monoxide, and nitrogen oxides
2 a decrease in hydrocarbons and an increase in carbon monoxide and nitrogen oxides
3 a decrease in hydrocarbons and carbon monoxide and an increase in nitrogen oxides
4 a decrease in hydrocarbons, carbon monoxide, and nitrogen oxides

78 The working substance in the external-combustion Sterling engine is

1 Freon 11
2 steam
3 air
4 hydrogen

79 The major technical problem with electric vehicles is

1 slow acceleration
2 battery weight
3 overheating
4 poor efficiency

Unit E Hydraulics (80-92)

80 Which substance can be compressed the least?

1 steam
2 water
3 hydrogen gas
4 a piece of wood

81 When air or a fluid is under pressure, fluid motion can be changed to mechanical motion through the use of

1 an actuator
2 a valve
3 a reservoir
4 a fluid conditioner

82 In an automatic transmission, the purpose of a manual valve is to provide

1 smooth clutch engagement
2 a range of transmission selections
3 oil pressure in the transmission
4 better band action

83 In an automobile transmission, the function of a fluid coupling is to

1 serve as a hydraulic clutch
2 multiply engine torque
3 build up hydraulic pressure to operate the valves
4 provide suitable gear ratios

84 A hydraulic pump changes the mechanical motion of an engine or electric motor into

1 pneumatic motion
2 fluid motion
3 electrical energy
4 chemical energy

85 Fluid pressure is computed as

1 force × area
2 $\frac{\text{area}}{\text{force}}$
3 force - area
4 $\frac{\text{force}}{\text{area}}$

86 When a force is applied to a liquid in a confined area, it will be transmitted

1 upwards, only
2 downwards, only
3 in a horizontal direction, only
4 in all directions

87 If a force of 20 pounds is applied to a 2-square-inch input piston, what will be the output force from a 20-square-inch output piston?

(1) 10 lb
(2) 20 lb
(3) 200 lb
(4) 2,000 lb

88 At which speed does a torque converter produce the greatest torque multiplication?

1 idle speed
2 low speed
3 cruising speed
4 high speed

89 In an automatic transmission, the purpose of the vacuum modulator and the modulator valve is to

1 permit smooth clutch and band engagements
2 provide a range of transmission selections
3 regulate the line oil pressure in the transmission
4 provide an extra forward-speed range

90 If the volume of a confined gas is halved, the pressure of the gas will

1 be halved
2 be doubled
3 remain the same
4 be quadrupled

91 The amount of pressure produced by a column of liquid is independent of the

1 column's height
2 type of liquid used
3 base area of the liquid
4 density of the liquid

92 Which two engineering fields deal with the transmission and control of fluid power?

1 hydraulics and motors
2 hydroelectrics and pneumatics
3 pneumatics and hydraulics
4 fluidics and motors

Unit F Engine Electricity (93-122)

93 The voltage necessary to cause a spark to jump the electrode gap of a spark plug depends upon the

1 amount of valve overlap
2 ignition advance
3 distance between the electrodes
4 volumetric efficiency of the engine

94 Which device transfers the voltage from the coil to the spark plugs?

1 induction coil
2 alternator
3 distributor
4 magneto

95 Which device causes a magnetic field to build up and then collapse in a battery ignition system?

1 condenser
2 distributor
3 voltage regulator
4 breaker contact points

96 In a battery ignition system, the breaker contact points are located in the

1 ignition coil
2 distributor
3 battery
4 alternator

97 A lead acid battery with six cells would have a maximum voltage of

(1) 6 volts
(2) 12 volts
(3) 18 volts
(4) 24 volts

98 When a stator is checked, one prod of a test lamp is touched to the frame and the other to the stator lead. What is indicated if the lamp lights?

1 a ground
2 a short circuit
3 an open circuit
4 a normally operating circuit

99 What part of an alternator changes the current from alternating to direct?

1 converter
2 commutator
3 rectifier
4 inverter

100 Which is the part in most alternators that generates the voltage?

1 rotor
2 stator
3 diode
4 rectifier

101 Compared to a magneto ignition system, an advantage of the battery ignition system is a

1 hotter spark at high rpm
2 hotter spark at low rpm
3 cooler spark at high rpm
4 cooler spark at low rpm

102 A cold plug is a type of spark plug designed for

1 dissipating heat rapidly
2 retaining heat
3 city driving
4 use in cold weather

103 When an ignition system is being tuned, a dwell meter is used to check

1 secondary circuit voltage
2 spark plug gap
3 engine ignition advance
4 breaker contact point gap

104 When an engine's ignition system is being tuned, a timing light is used to

1 measure breaker contact gap
2 determine ignition advance
3 measure spark plug gap
4 determine condenser capacity

105 Which device is an ignition coil?

1 a step-up transformer
2 a step-down transformer
3 an induction gage
4 a rheostat

106 When a battery charger is being connected to a battery, the positive lead of the battery charger should always be connected to the

1 positive terminal of the battery
2 negative terminal of the battery
3 smallest terminal of the battery
4 frame of the car

107 What is used to fill the positive plate grids of a storage battery?

1 lead peroxide
2 antimony oxide
3 hydrochloric acid
4 sulphuric acid

108 Which instrument is used to measure the specific gravity of a liquid?

1 hygrometer
2 barometer
3 hydrometer
4 ammeter

109 What is the permissible voltage variation between the cells of a battery when making a high rate discharge test?

(1) 0.02 volt
(2) 0.2 volt
(3) 0.3 volt
(4) 0.6 volt

110 What is the function of the transistor in a transistor-type ignition system?

1 It transforms the battery voltage to a higher voltage.
2 It turns the primary current on and off.
3 It distributes the high tension current to the spark plugs.
4 It reverses the polarity of the secondary circuit.

111 Which type is the Ford transistor ignition system?

1 pulse type
2 capacitor discharge type
3 magnetic controlled type
4 contact controlled type

112 Which condition would require the greatest amount of voltage in order for the spark plug to function?

1 a new plug
2 an old plug
3 an oil-fouled plug
4 a cold plug

113 Which type diaphragm is connected to the carburetor vacuum in a distributor?

1 retard diaphragm 3 advance diaphragm
2 carburetor diaphragm 4 pump diaphragm

114 What is the approximate voltage at the secondary of an ignition coil?

(1) 12 volts (3) 5,000 volts
(2) 110 volts (4) 20,000 volts

115 Which unit is used to express the capacity of an ignition condenser?

1 volt 3 joule
2 farad 4 microfarad

116 At what angle to the direction of a magnetic field should a wire cross the field in order to produce the greatest amount of current in the wire?

(1) 45° (3) 180°
(2) 90° (4) 360°

117 A coil has an input of 12 volts and 40 amperes. If 16,000 volts are needed to jump the spark plug gap, how many amperes are necessary?

(1) 0.00003 amp (3) 3 amps
(2) 0.03 amp (4) 33 amps

118 Compared to a battery ignition system, an advantage of a magneto ignition system is a

1 hotter spark at high rpm 3 cooler spark at high rpm
2 hotter spark at low rpm 4 cooler spark at low rpm

119 In an ignition system, the term "point dwell" refers to how

1 long the points stay open
2 long the points stay closed
3 many times the points open and close per minute
4 widely the points will open

120 Compared to the amount of primary current in an ignition system, the amount of secondary current is

1 less in a magneto ignition system, only
2 greater in a magneto ignition system, only
3 the same in both a battery and a magneto ignition system
4 less in both a battery and a magneto ignition system

121 What factors must be present in order to produce electricity by mechanical action?

1 movement, a conductor, and a high voltage
2 a magnetic field, a conductor, and a coil
3 movement, a magnetic field, and a current
4 movement, a conductor, and a magnetic field

122 Which circuit contains the breaker contact points in a battery ignition system?

1 secondary
2 primary
3 ground
4 magneto

Unit G Careers and Industry (123-135)

123 Which industry currently has the greatest number of job opportunities?

1 aerospace industry
2 recreational vehicle industry
3 automotive industry
4 chemical energy industry

124 The problems of transporting people and goods are being made more complex and costly due to

1 increased systems repair and maintenance
2 air pollution caused by internal-combustion engines
3 new safety regulations
4 the shortage of satisfactory fuels

125 Who was the first automotive manufacturer to use a conveyer belt to increase auto production?

1 Duryea brothers
2 Ransom Olds
3 Dodge brothers
4 Henry Ford

126 What is the job title of the supervisor of lubrication personnel in a large dealership?

1	repair shop foreman	3	general manager
2	service manager	4	office manager

127 The average life of an automobile was 6½ years in 1925. What is the average life of a modern automobile?

(1)	15 years	(3)	8 years
(2)	11 years	(4)	4 years

128 Which man was credited with developing the idea of interchangeable parts?

1	Henry Ford	3	Ransom Olds
2	Eli Whitney	4	Alexander Winton

129 When automotive mechanics concentrate their training and experience in one area, they are called

1	certified mechanics	3	professionals
2	service managers	4	specialists

130 Which type of mechanic would deal with customers, diagnose problems, prepare cost estimates, and do the actual repair work?

1	specialist	3	small garage mechanic
2	general manager	4	service manager

131 What is the ratio of automotive workers to all other types of industrial workers in the United States?

(1)	1 to 4	(3)	1 to 8
(2)	1 to 6	(4)	1 to 10

132 Which type engine is manufactured by Lawn Boy, Briggs & Stratton, and Tecumseh?

1	vapor engines	3	electric motors
2	rotary engines	4	internal-combustion piston engines

133 Which of the following is a primary source of information about careers in aircraft maintenance and repairs?

1 "Borg-Warner Handbook"
2 "Machine Design" reference issue (occupations)
3 "Occupational Outlook Handbook"
4 U.S. Government publications

134 What is the job classification of an individual responsible for the design and development of a new energy system application?

1 management
2 engineer
3 technician
4 industrial designer

135 Which general occupational category includes the areas of energy, power mechanics and services?

1 power technology
2 technical force manipulation
3 mechanics of energy control
4 power

Part II Aerospace

Unit A Vehicles (136-174)

136 The primary function of the vertical and horizontal stabilizers is to provide

1 balance to compensate for load variation
2 stability in severe crosswinds
3 stability during normal flight
4 a counterbalance for control surfaces

137 What type of bracing does a full cantilever wing have?

1 external bracing, only
2 internal bracing, only
3 external and internal bracing
4 cellular construction

138 The wood most commonly used in building models is

1 Sitka spruce
2 balsam fir
3 ash
4 balsa

139 Extruded members in aircraft structures are parts which are made by

1 spot welding
2 riveting at specific points
3 forming one single unit
4 heli-arc welding techniques

140 Which devices are used to enable "hands off" stable flight for an aircraft?

1 flaps
2 ailerons
3 trim tabs
4 stabilizers

141 Magnesium is used in aircraft construction because it is

1 inexpensive
2 noncorrosive
3 stronger than steel
4 lightweight

142 One of the causes of metal fatigue in aircraft frames is

1 high temperature
2 air friction
3 flexing
4 yawing

143 Which control surface rotates an airplane about its longitudinal axis?

1 vertical stabilizer
2 horizontal stabilizer
3 ailerons
4 trim tabs

144 Blade coning of a helicopter is a result of

1 low pitch of the rotor blades
2 too little torque of the tail rotor
3 high pitch of the rotor blades
4 lift and centrifugal force combined

145 During which stage of a space flight could an escape tower be successfully employed?

1 during orbit
2 at splashdown
3 during blastoff
4 between rocket stages

146 Increasing the dihedral of a wing increases

1 drag
2 stability
3 speed
4 maneuverability

147 The covering around an engine is called the

1 hood
2 slots
3 cowling
4 heat shield

148 Which is an example of a lighter-than-air aircraft?

1 dirigible
2 helicopter
3 glider
4 parachute

149 An altimeter operates due to changes in air

1 speed
2 pressure
3 humidity
4 temperature

150 If a helicopter has an engine failure at 2,000 feet, the pilot should

1 look for a place to land with freewheeling rotor
2 use the rotor to restart the engine
3 dive the helicopter to pick up speed for an in-air start
4 bail out

151 Stressed-skin fuselage construction is a combination of

1 formers and stringers 3 rings and bulkheads
2 longerons and bulkheads 4 stringers and trusses

152 Which type aircraft has a truss-type fuselage?

1 heavy-duty cargo aircraft
2 light-duty general utility aircraft
3 high performance aircraft
4 aerobatic aircraft

153 Which type engine is usually used in light, propeller-driven aircraft?

1 turbine 3 reaction
2 rotary 4 reciprocating

154 Low-speed aircraft (300 miles per hour and less) are classified as

1 supersonic 3 subsonic
2 hypersonic 4 transonic

155 Helicopter rotor decay may be readily detected by

1 observing the rotor tachometer
2 periodic inspection
3 severe vibration of the aircraft
4 excessive manifold pressure

156 The oleo shock strut on a landing gear shock system is filled with

1 oil, only 3 oil and compressed air
2 compressed air, only 4 springs

157 Aircraft with fabric-covered surfaces require special tests at inspection periods because

1 moths and insects attack the fabric
2 moisture weakens the fabric fibers
3 the surface paint cracks with age
4 Federal regulations require it

158 Wet-wing construction is a type of wing design that uses the wing section as a

1 housing for the landing gear
2 storage area
3 fuel cell
4 self-sealing reserve tank

159 Which system of an aircraft uses isopropyl alcohol?

1 hydraulic system
2 anti-icing system
3 air-conditioning system
4 oil-cooler system

160 What is an ultimate load in relation to aircraft structural limitations?

1 a limit load multiplied by the appropriate factor of safety
2 the maximum load anticipated in normal flight conditions
3 the maximum certified gross weight
4 the maximum load at which structural deformation will occur

161 The stabilizer is a control surface which governs the aircraft's

1 yaw
2 roll rate
3 pitch
4 stall speed

162 Spoilers are used on gliders to

1 reduce air friction on surfaces
2 disrupt air flow over wing surfaces
3 disengage the tow rope
4 increase lift during takeoff

163 Who was a pioneer in the development of rotary-wing aircraft?

1 Igor Sikorsky
2 Billy Mitchell
3 Glenn Curtiss
4 Amelia Earhart

164 A cantilevered wing is a wing which is

1 swept back
2 movable in flight
3 braced internally
4 made up of fuel cells

165 The STOL type of aircraft is designed for takeoff and landing on

1 a launching pad
2 a short runway
3 a water surface
4 an aircraft carrier

166 Wind tunnel models are built to afford design data by

1 controlled velocity of air along the thrust line
2 climate flight conditions
3 variable temperature conditions
4 stresses and strains on the model components

167 Autorotation is a period of helicopter and Autogyro flight operation when

1 rotor blades are increased in pitch
2 forward thrust is decreased
3 forward thrust is increased
4 no rotor torque is developed

168 What are the two basic types of industrial model aircraft?

1 static and dynamic
2 flying radio-controlled models and free-flight models
3 mockup and static models
4 full-size prototypes and full-size drawings

169 The airspeed indicator is attached to the

1 static vent and Pitot tube
2 static vent, only
3 Pitot tube, only
4 ram air vent

170 The components making up the empennage are the elevators plus the

1 rudder, trim tab, and fin
2 rudder, horizontal stabilizer, and fin
3 ailerons, trim tab, and fin
4 horizontal stabilizer, flaps, and rudder

171 Compared to a straight-wing airplane, what is the effect of a swept-back wing on the critical Mach number?

1 a decrease in the Mach number as altitude decreases
2 a decrease in the Mach number as altitude increases
3 the Mach number remains constant
4 an increase in the Mach number

172 The primary function of the helicopter tail rotor is to control the

1 movement about the vertical axis
2 roll rate about the horizontal axis
3 pitch angle
4 rate of climb

173 The angle of attack is adjusted for the main rotor blades of a helicopter at

1 a high angle of attack at the factory
2 a low angle of attack before each flight
3 zero angle of attack at periodic inspections
4 a variable angle of attack in flight

174 Which device provides the Autogyro with lift and thrust?

1 a large, powered overhead air screw
2 a system of hinged revolving blades
3 a combination of propeller and free rotating blades
4 a combination of propeller and powered rotating blades

Unit B Flight (175-206)

175 The ratio between the total air load imposed on wings and the gross weight in flight is called the

1 aspect ratio
2 yield load
3 load factor
4 power loading

176 What effect will occur if the air on the upper surface of a wing moves faster than the air on the lower part of the wing?

1 stall
2 lift
3 turbulence
4 yaw

177 What is the reason that a jet aircraft moves forward?

1 The exhaust gases push it forward.
2 There is an opposing reaction to the escaping gases.
3 Torque is created by the spinning turbine wheel.
4 The engine is pulling the aircraft through the air.

178 If a wing were flat on top, lift could still occur if the wing were

1 moving fast enough
2 rounded on the bottom side
3 at a sufficient angle of attack
4 flat on the bottom side

179 What type engine is most widely used in model airplanes?

1 rotary
2 two-stroke cycle
3 turbojet
4 four-stroke cycle

180 What type gravitational force is a pilot undergoing in performing an outside loop?

1 negative gravity
2 positive gravity
3 weightlessness
4 normal gravity

181 Compared to an airplane's airspeed, its groundspeed

1 is always greater
2 is always less
3 is always the same
4 may be less, the same, or greater

182 Two radio-controlled model airplanes can be flown in the same area at the same time only if they are

1 on the same frequency
2 on different frequencies
3 being controlled by a two-channel transmitter
4 carrying the same brand of receiver

183 The resistance produced by a part of an airplane that does not contribute to lift is called

1 torque
2 parasite drag
3 wind turbulence
4 crabbing

184 What is ground cushion (ground effect) in relation to helicopter flight?

1 additional lift developed by higher surface temperatures near the ground
2 a volume of air packed between the rotor blades and the ground
3 a vacuum between the rotors and the ground
4 a change in air velocity at the tail rotor

185 What kind of ignition system is generally used on model airplane engines?

1 magneto
2 Glo-plug
3 battery, coil, condenser, and spark plug
4 transistorized

186 A Student Pilot Certificate issued on December 3 of this year will expire in

1 one year on Dec. 3
2 two years on Dec. 31
3 three years on Dec. 3
4 six months on June 3

187 What are the frequency restrictions for radio-controlled model aircraft?

1 none
2 the transmitter power output must be under 10 watts
3 the transmission antenna must be under three feet in length
4 only frequencies specified by the FCC may be used

188 The direction of the lift of an airfoil is

1 perpendicular to the wing chord
2 at right angles to the center of pressure
3 at right angles to the relative wind
4 in the direction of higher relative pressure

189 In relation to the thrust line of a helicopter, the airflow pattern created by the forward flight of the helicopter is

1 in the same direction
2 in the opposite direction
3 upward
4 downward

190 The distance a glider moves forward as compared with its descent is called

1 aspect rate
2 trailing vertex
3 glide rate
4 freestream velocity

191 On an average day, the speed of sound at sea level is

(1) 700 mph
(2) 727 mph
(3) 761 mph
(4) 780 mph

192 Which maneuver, properly performed, imposes the greatest load on an aircraft's structure?

1 snap roll
2 slow roll
3 spin
4 lazy eight

193 Wing slots increase the maximum angle of attack and

1 increase lift at all speeds
2 prevent unintentional spins
3 increase normal climb rate
4 decrease normal climb rate

194 The person directly responsible for the safe operation of an aircraft is the

1 registered owner
2 chief pilot
3 pilot in command
4 flight engineer

195 What type of written consent is required for an 18-year-old, married female student pilot applying for a Private Pilot Certificate?

1 husband's
2 parent's
3 none
4 an official in the FAA

196 In relation to the line of flight of an aircraft, the angle of the wing is called

1 pitch
2 yaw
3 dihedral
4 attack

197 In an airplane, which control surface is used to control yaw?

1 rudder
2 elevator
3 ailerons
4 trim tabs

198 As air density increases, an airplane's lift

1 increases, and drag decreases
2 increases, and drag increases
3 decreases, and drag decreases
4 decreases, and drag increases

199 "Barnstorming" took place after World War I, when some pilots made a living by

1 performing for people across the country
2 using biplanes for crop dusting
3 flying airmail routes
4 being soldiers of fortune

200 The purpose of flaps on an airplane is to increase

1 drag
2 range
3 stalling speed
4 landing speed

201 Which control surface pivots an airplane on its lateral axis?

1 elevator
2 rudder
3 ailerons
4 flaps

202 Which type of rating is a multiengine rating?

1 category rating
2 class rating
3 type rating
4 model rating

203 Compared to the takeoff distance of an aircraft in winter, the takeoff distance of the aircraft in summer will be

1 shorter, because the air is denser
2 shorter, because the engine warms up faster
3 longer because the air is thinner
4 the same

204 An airplane is banked through the manipulation of the

1 ailerons
2 elevators
3 trim tabs
4 flaps

205 The angle of attack is the angle between the chord line of the airfoil and the

1 camber
2 horizon
3 relative wind
4 wing vortex

206 The angle of incidence is the angle the chord line makes with the

1 vertical axis
2 relative wind
3 camber
4 longitudinal axis

Unit C Piston Engines (207-223)

207 How many cylinders do radial engines usually have?

(1) 8, 12, or 16
(2) 5, 7, 9, or 18
(3) 5, 7, 9, or 12
(4) 4, 7, or 8

208 The function of the fins around each cylinder of an aircraft engine is to

1 protect the cylinder housing from damage
2 allow heat to escape and increase cooling
3 streamline the engine and reduce drag
4 strengthen the cylinder housing

209 Water-cooled engines are not used extensively in modern aircraft because they

1 develop rust
2 freeze at higher altitudes
3 are underpowered
4 overheat if a leak develops

210 The purpose of having a dual ignition system on an aircraft is to provide a

1 backup system for safety
2 separate system for a twin-engine aircraft
3 hotter spark to the engine
4 secondary system for igniting an afterburner

211 Two typical engine cylinder configurations are

(1) 6-cylinder in-line, and 9-cylinder opposed
(2) 7-cylinder in-line, and 6-cylinder opposed
(3) 8-cylinder in-line, and 5-cylinder opposed
(4) 6-cylinder in-line, and 4-cylinder opposed

212 The basic purpose of the modern aircraft engine supercharger is to provide

1 sea-level pressure at upper altitudes
2 better fuel distribution
3 better fuel consumption
4 greater power for takeoffs

213 Which type engine has pistons?

1 rotary
2 ramjet
3 turbojet
4 reciprocating

214 What type rating is the octane classification of gasoline?

1 power rating
2 antiknock rating
3 percentage of additive rating
4 volatility-of-fuel rating

215 Carburetor icing is caused by

1 reduced venturi pressure
2 excessive fuel contamination
3 chemical reaction of moisture and fuel
4 improper mixture-control setting

216 If the scavenger pump fails on a dry-sump engine, it would cause

1 failure of the entire engine oil system
2 the oil to overflow the engine
3 fouling of the spark plugs
4 fuel contamination

217 What must be added to fuel suitable for a 4-stroke engine before it can be used for a 2-cycle engine?

1 oil
2 lead additive
3 higher octane fuel
4 coolant

218 The function of a carburetor is to

1 atomize the liquid gas
2 pump gas to the intake manifold
3 switch fuel tanks as each empties
4 keep the fuel at a certain temperature

219 What type engine would have a master rod?

(1) opposed engine
(2) in-line engine
(3) V-engine
(4) radial engine

220 Dual ignition is required on piston-type aircraft engines with a horsepower rating of

(1) 200, only
(2) 500, only
(3) 1,000, only
(4) any range

221 What will result from using an engine oil with a lower-than-specified viscosity?

1 low oil pressure
2 high oil pressure
3 foaming conditions
4 low oil temperature

222 What type coolant is used in liquid-cooled aircraft engines?

1 denatured alcohol
2 water and alcohol
3 ethylene glycol
4 liquid Freon

223 Air-cooled engines are cooled by a system of

1 ducting, cowling, and baffles
2 propeller-driven air
3 engine-driven fans
4 exposing cylinders to a general flow of air

Unit D Reaction Engines (224-239)

224 The first successful patented turbine engine was developed by

1 F.A. Whittle in England
2 Heinkel in Germany
3 General Electra Corp. in America
4 Maxim Gorky in Russia

225 The three principal parts of the turbine engine are the combustion chamber,

1 compressor, and afterburner
2 compressor, and turbine wheel
3 exhaust cone, and compressor
4 ignition system, and turbine wheel

226 Augmentation (afterburning) is a method of increasing thrust by means of

1 introduction of fuel in the tailpipe
2 the addition of a tertiary compressor system at the tailpipe
3 the addition of cooler air to the tailpipe
4 a baffle system in the tailpipe to control air flow

227 Augmentation (afterburning) may increase thrust by as much as

(1) 10%
(2) 25%
(3) 50%
(4) 100%

228 To operate in space, a rocket engine requires a supply of fuel and

1 helium
2 nitrogen
3 oxygen
4 Freon

229 How is a jet engine used to slow down an airplane after landing on the runway?

1 by reversing the rotation of the engine
2 by reversing the flow of air through the engine
3 by deflecting the thrust forward
4 by turning on the afterburner

230 Which is the proper sequence of stages for a reaction engine?

1 intake, compression, power, exhaust
2 compression, power, intake, exhaust
3 power, compression, intake, exhaust
4 intake, power, compression, exhaust

231 Jet-engine fuel is a refined type of

1 unleaded gasoline
2 kerosene-like petroleum derivative
3 gasoline with special additives
4 leaded butane

232 The compressor in a turbojet engine is driven by a shaft connected to the

1 afterburner
2 supercharger
3 turbine wheel
4 flywheel

233 Which type engine operates on the same principle as a rotating water sprinkler?

1 a radial engine
2 a rotary engine
3 a jet engine
4 a reciprocating engine

234 A structural characteristic of a ramjet engine is that it has

1 a coaxial turbine
2 first-aid, second-stage impellers
3 no moving parts
4 a turbine reduction gear system

235 Turboprop aircraft engines reduce high turbine shaft speeds by

1 reduced fuel mixtures
2 increased propeller pitch
3 engine governors
4 a reduction gear system

236 A disadvantage of the ramjet engine is that it

1 operates below the speed of sound, only
2 needs to attain a high velocity in order to function
3 has many moving parts
4 operates with exotic fuels

237 Fuel is metered to a turboprop engine in relation to the

(1) air flow, only
(2) rpm, only
(3) temperature, air pressure, and rpm
(4) air flow, propeller blade angle, and desired power output

238 Reaction engines may be classified according to

1 the type of fuel they use
2 the amount of thrust they produce
3 the type of compressor they employ
4 whether they have augmentation capability

239 A particularly dangerous contaminant of aircraft fuel is

1 ordinary water and moisture
2 alcohol
3 lubricating oil
4 ethylene glycol

Unit E Rocket Engines (240-257)

240 Rocket engines are generally classified according to

1 the number of engine stages
2 the amount of engine thrust
3 their application to a vehicle
4 whether they are powered by solid or liquid propellants

241 A bipropellant fuel system uses

1 separate tanks for the fuel and oxidizing agent
2 a common tank for both fuel and oxidizer
3 a combination of solid fuel with liquid oxidizer
4 a solid oxidizer with a liquid fuel

242 Rocket engines function in a vacuum in space because the

1 fuel system supplies its own oxygen to support combustion
2 initial escape velocity of the rocket is so great
3 resistance to motion is negligible
4 fuel can burn without oxygen

243 What are the three factors associated with the experimental ion rocket principle?

1 high thrust, high exhaust velocity, low acceleration
2 low thrust, low acceleration, high exhaust velocity
3 low thrust, low acceleration, high exhaust temperature
4 low thrust, high acceleration, low exhaust temperature

244 Rocket engine stages are usually separated by a device called

1 an exploding bridge wire
2 a charged bolt
3 a radio-controlled unlocking catch
4 a motor-driven pin

245 Burning rate is determined by the

1 number of pounds of fuel consumed
2 speed at which a solid fuel is consumed
3 velocity of the rocket in conjunction with the fuel consumption
4 time it takes for the fuel and oxidizer to ignite

246 The first people to invent rockets were the

1 Russians
2 Germans
3 Chinese
4 Americans

247 In relation to rockets, specific impulse refers to the

1 amount of thrust of one pound of propellant in one second
2 instantaneous velocity of a spacecraft in orbit
3 orbital velocity of a satellite
4 total thrust of a rocket at the moment of lift-off

248 Who developed the first successful liquid-fuel rocket?

1 Goddard
2 von Braun
3 Sikorsky
4 Curtiss

249 What are the two types of oxidizers used by liquid-propellant rockets?

1 hydrogen and oxygen
2 kerosene and hydrogen
3 nitrogen and oxygen
4 nitric acid and oxygen

250 Compared to a solid-propellant rocket engine, one advantage of a liquid-propellant rocket engine is that it is

1 less expensive
2 more powerful
3 safer to start
4 easier to regulate

251 Which country put the first satellite into orbit?

1 the United States
2 Germany
3 the Soviet Union
4 England

252 What determines the burn rate of a solid-fuel propellant?

1 the size and shape of the hole inside the grain
2 the amount of propellant
3 the size of the combustion chamber
4 the amount of oxygen present in the atmosphere

253 What are the two types of rocket engine solid propellants?

1 oxidizer and nonoxidizer
2 restricted and unrestricted
3 solid fuel and semisolid fuel
4 bipropellant and monopropellant

254 Solid-propellant engines are normally ignited by using

1 a heated wire
2 a percussion cap
3 heat generation of two chemicals
4 pyrotechnic igniters

255 A convergent-divergent (DeLaval-type) nozzle is used to

1 handle the liquid oxidizer safely
2 handle the liquid fuels safely
3 inject the fuel-oxidizer mixture into the combustion chamber
4 direct and control the exhaust

256 Compared to a single-stage rocket, a multistage rocket has the advantage of a

1 greater mass-to-power ratio
2 lower mass-to-power ratio
3 more simplified construction
4 lower production cost

257 Which formula is the mathematical expression for acceleration?

(1) $\frac{\Delta v}{a} = \Delta t$

(2) $\frac{\Delta t}{\Delta v} = a$

(3) $\frac{a}{\Delta v} = \Delta t$

(4) $\frac{\Delta v}{\Delta t} = a$

Unit F Space Vehicles (258-273)

258 The term "telemetry" refers to the

1 celestial tracking of a space vehicle during flight
2 monitoring of the performance of a space vehicle during flight
3 inertial guidance systems of a space vehicle
4 computer control systems of a manned satellite

259 An important byproduct of the fuel cells used on board a spacecraft is

1 oxygen for breathing purposes
2 water to sustain the occupants
3 heat for normal calcium temperatures
4 Freon for cooling the interior of the spacecraft

260 Fuel cells aboard a space service module produce electricity from

1 hydrogen and oxygen
2 argon and oxygen
3 ozone and nitrogen
4 nitrogen and oxygen

261 What is the usual radio range for primary voice-link communication?

(1) UHF/FM and S band
(2) UHF/AM
(3) VHF/AM, only
(4) VHF/AM and S band

262 Which device controls the guidance systems used aboard spacecraft?

(1) gyroscope
(2) radar set
(3) UHF radio
(4) laser gun

263 To place a satellite into orbit around the Earth, it is necessary to accelerate the vehicle to a velocity of

(1) 1,500 mph
(2) 3,500 mph
(3) 10,000 mph
(4) 17,500 mph

264 The human body can withstand and function after enduring a maximum g force of

(1) 0 to 10 units
(2) 11 to 20 units
(3) 21 to 30 units
(4) 31 to 40 units

265 The change in frequency of wave motion due to the acceleration of a sound or light source is known as the

1	Doppler effect	3	Dobson spectrophotometer observation
2	Doppler shift	4	Dalton law

266 Escape velocity is the speed required for a space vehicle to overcome the effect of

1	inertia	3	momentum
2	gravity	4	air resistance

267 An example of an object undergoing zero gravity is

1	a block floating in water	3	a satellite in orbit
2	a rocket taking off	4	an airplane pulling out of a dive

268 Zero gravity means that gravity is

1 balanced by another force
2 canceled by a greater force
3 absent
4 normal

269 What is used by NASA to track satellites?

1	ground stations	3	visual sightings
2	tracking satellites	4	laser beams

270 When data are gathered through telemetry, physical phenomena are measured in terms of

1	current analogues	3	voltage analogues
2	resistance analogues	4	wattage analogues

271 What type of transformation is involved in telemetry?

1	digital to analogue	3	mechanical to electronic
2	analogue to digital	4	photoelectric to mechanical

272 The in-flight altitude of a spacecraft is controlled by a series of

1 stabilizing fins
2 primary propulsion systems
3 commands from the base station
4 retro rockets

273 What type of bearing is azimuth in relation to a fixed point?

1 an upward perpendicular bearing
2 an angular bearing
3 a horizontal bearing
4 a downward perpendicular bearing

Unit G Industrial Organization (274-290)

274 Henry Ford's major contribution to the development of air transportation was the

1 development of the Ford trimotor airplane
2 techniques of mass production
3 development of water-cooled engines
4 emphasis on precision manufacturing

275 The most structurally advanced fighter plane of World War I was the

1 Fokker D-VIII
2 Spad
3 Sopwith Camel
4 Jenny (JN-4)

276 What airplane developed in the late 1930's became the most common transport plane and is still in service in many airlines?

(1) DC-3
(2) F-14
(3) T-6
(4) FW-190

277 What is the major significance of the Apollo-Soyuz space flight?

1 Two spacecraft successfully docked.
2 The first space station was established.
3 Two countries cooperated on a space flight.
4 The U.N. organized the first international space venture.

278 Who was the inventor of the autopilot?

1 Curtiss
2 Fokker
3 Sperry
4 Sikorsky

279 Curtiss was called the Father of Naval Aviation because he was the first pilot to

1 take off and land a plane on the deck of a ship
2 be catapulted from the deck of a carrier
3 prove a ship could be destroyed by aerial bombing
4 take off from a hook suspended from a Navy blimp

280 The end of lighter-than-air aircraft as a major means of transportation resulted from the destruction of the

1 Graf Zeppelin
2 Hindenburg
3 Akron
4 Macon

281 The overall policymaking body for the national space program is the

1 Atomic Energy Commission
2 President and his cabinet
3 National Aeronautics and Space Administration
4 Unites States Air Force

282 Which is the method for the construction of a spacecraft?

1 basic operational systems on contract
2 entire vehicle on single contract
3 propulsion and container systems
4 module development and delivery system

283 One of the main reasons the development of the S.S.T. was turned down in the U.S. was that

1 it created too much noise pollution
2 runways would have to be lengthened
3 it was too fast to land safely
4 it did not carry enough passengers

284 Which President provided the leadership for the first national commitment to a specific space project?

1 Dwight Eisenhower
2 Lyndon Johnson
3 Richard Nixon
4 John F. Kennedy

285 Which strategy is employed by aerospace industries to insure corporate growth and profit?

1 accelerating production
2 diversifying product application
3 selling more stock
4 making more capital improvement

286 The aerospace industry has been responsible for the recent research and development programs in the field of

1 celestial navigation
2 sound transmission
3 radio telescopes
4 television

287 The country that built and successfully tested the first jet engine was

1 the United States
2 Germany
3 Great Britain
4 France

288 One of the basic functions of management is to

1 develop production techniques
2 plan corporate operations
3 coordinate cost-control management
4 establish depreciation accounts

289 What type of service is performed by a subcontractor?

1 specialized work
2 Government projects, only
3 general maintenance
4 corporate financing

290 What was the name of the American two-man space flight program?

1 Apollo
2 Mariner
3 Gemini
4 Mercury

Group Questions (291-319)

291 On the line at the left of each transmission term in parts a through e, write the number of the phrase, chosen from the list below, that best relates to that term. [5]

Phrases

(1) Fluid drive
(2) Crankshaft and driveshaft turn at same speed
(3) Energy is absorbed
(4) Receives power from engine
(5) Shaft turns
(6) Friction free
(7) Double universal joint

_____ a Bearing

_____ b Constant velocity

_____ c Direct drive

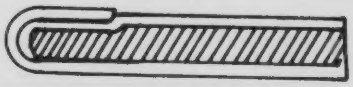
_____ d Flywheel

_____ e Input shaft

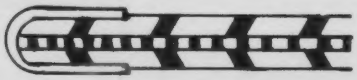
292 Five types of cylinder head gaskets are shown in parts a through e. On the line at the left of each diagram, identify the type of gasket shown. [5]

Section at Combustion Seal

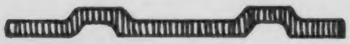
________________ a



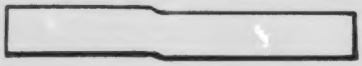
________________ b



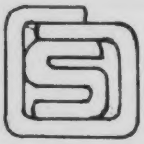
________________ c



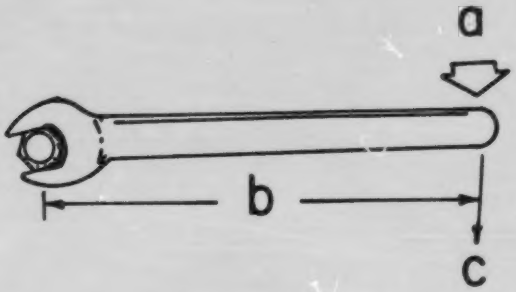
________________ d



________________ e



293 For each of parts a through e in the diagram below, supply the related terms designated by each letter. [5]



a ________________

b ________________

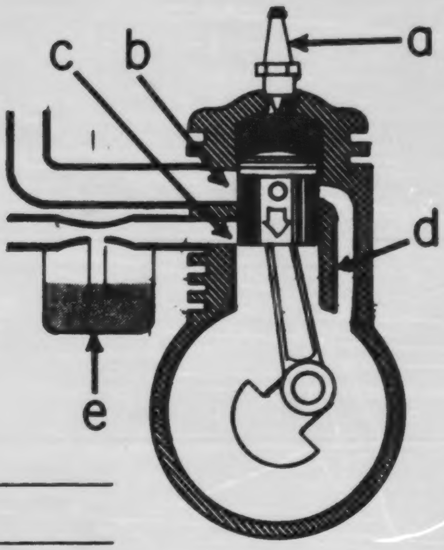
c ________________

The formula for determining torque is (d) × (e) .

d ________________

e ________________

294 For each of parts a through e in the diagram below, write in the space provided the name of the part that is indicated by that letter. [5]



a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

295 On the line at the left of each term in parts a through e, write the number of the definition, chosen from the list below, that best defines that term. [5]

Definitions

(1) Increase pressure of a gas
(2) Measure of velocity
(3) Measure of energy
(4) Measure of speed
(5) Fitting one surface to another
(6) Measurement of power
(7) "Play" between two parts

_____ a Backlash

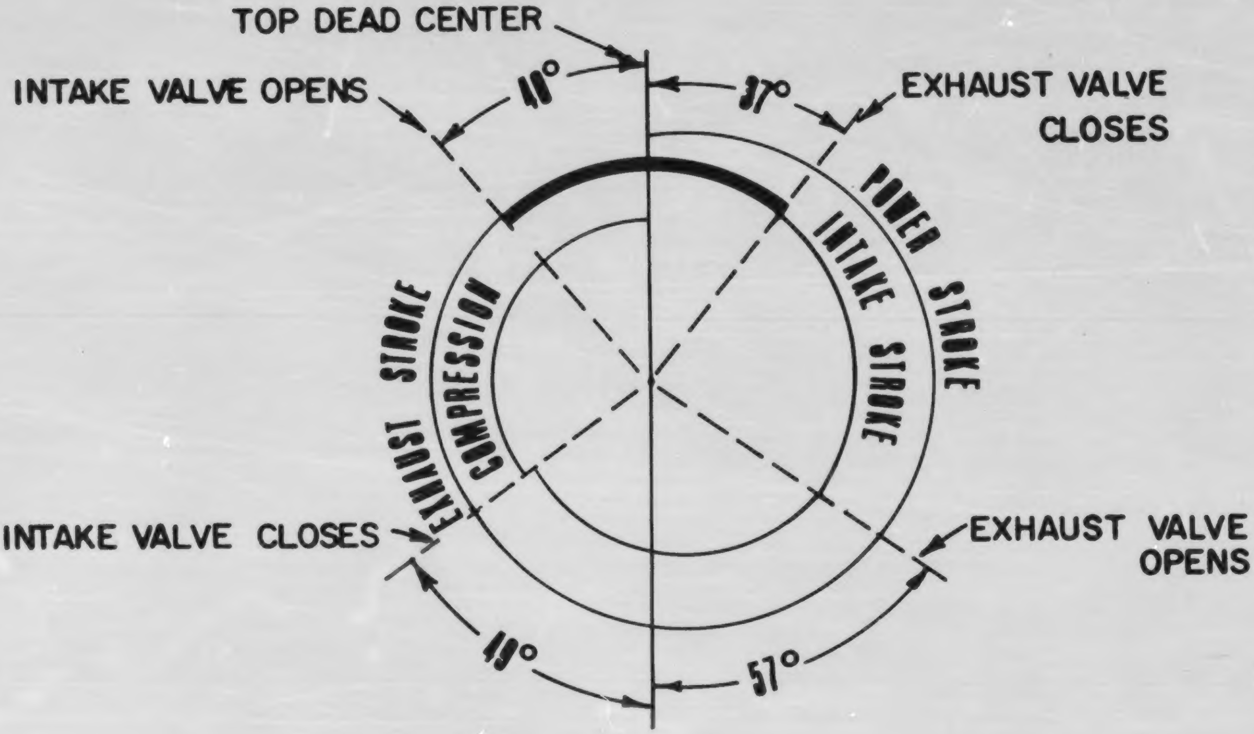
_____ b Brake horsepower

_____ c Lapping

_____ d Compression

_____ e Foot/pound

296 Base your answers to parts a through c on the spiral graph below, which represents two crankshaft revolutions (720°) of a 4-stroke-cycle, internal-combustion piston engine. [3]


TOP DEAD CENTER
INTAKE VALVE OPENS
18°
37°
EXHAUST VALVE CLOSES
POWER STROKE
INTAKE STROKE
COMPRESSION STROKE
EXHAUST STROKE
INTAKE VALVE CLOSES
EXHAUST VALVE OPENS
19°
57°

_____ a In degrees of crankshaft revolution, what is the total duration that the intake valve is open?

_____ b In degrees of crankshaft revolution, what is the total duration that the exhaust valve is open?

_____ c In degrees of crankshaft revolution, what is the amount of valve overlap?

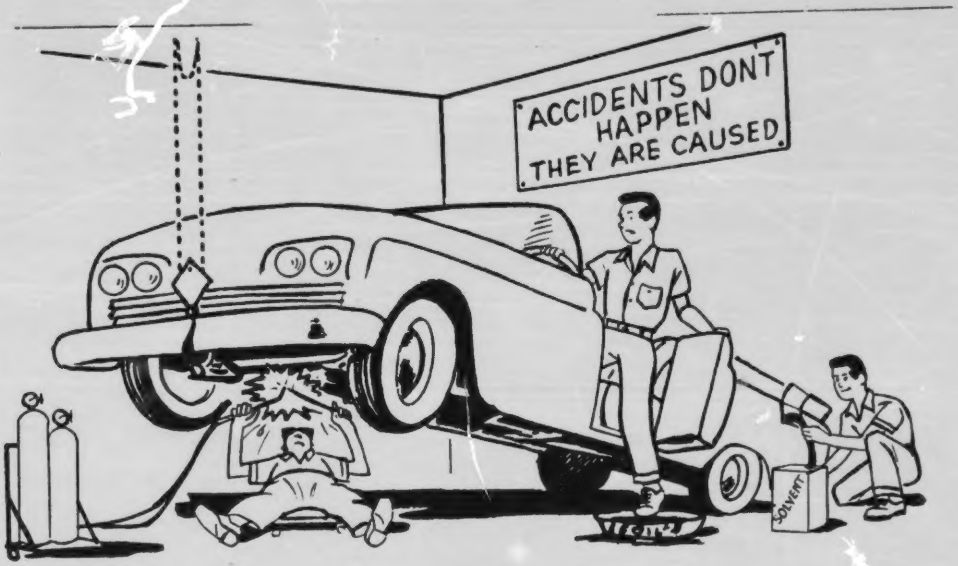
297 Base your answers to parts a and b on the information given below for a single-cylinder, internal-combustion piston engine. [2]

- Clearance volume = 1 cubic inch
- Cylinder bore = 2.00 inches
- Cylinder stroke = 2.00 inches
- Peak horsepower = 4,000 rpm

__________ a Determine the cylinder displacement.

__________ b Determine the compression ratio.

298 In the space provided, list five unsafe conditions illustrated below. [5]


ACCIDENTS DONT HAPPEN THEY ARE CAUSED
SOLVENT

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

299 In the space provided, list the five components of a hydraulic system. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

300 In the space provided, list five advantages of hydraulic systems over mechanical systems. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

301 In the space provided, list five ways in which spark plugs may differ. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

302 In the space provided, list the five major parts of a fuel system and explain the function of each part. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

303 In the space provided, list five causes of black deposits on a spark plug in a two-cycle engine. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

304 In the space provided, list five possible causes of engine skip or misfire. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

305 In the space provided, list five design changes or alterations that could be made to adapt car engines for use in light trucks. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

306 In the space provided, list five functions of oil in an automobile engine. [5]

a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

307 In the space provided, list five causes of carburetor flooding. [5

a ____________________

b ____________________

c ____________________

d ____________________

e ____________________

308 In the space provided, name five engine malfunctions that may be detected with a vacuum gage. [5]

a ____________________

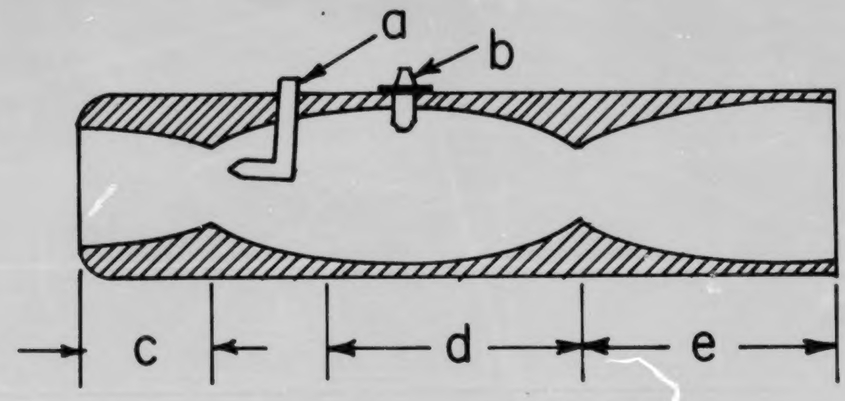
b ____________________

c ____________________

d ____________________

e ____________________

309 For each of the ramjet parts labeled a through e in the diagram below, write in the space provided the name of that part of the ramjet engine. [5]



a ____________________

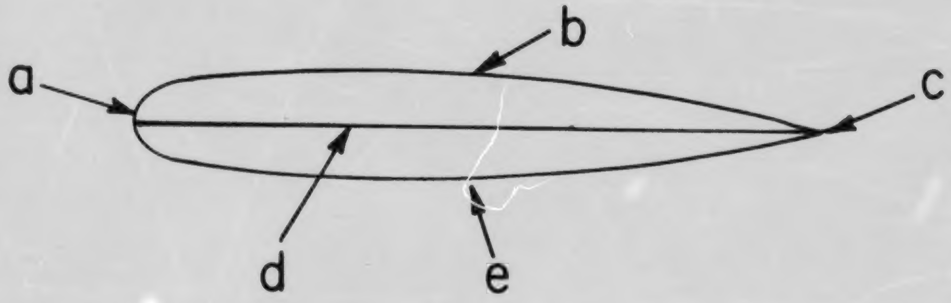
b ____________________

c ____________________

d ____________________

e ____________________

310 For each of the airfoil parts labeled a through e in the diagram below, write in the space provided the name of that airfoil part. [5]



a ____________________

b ____________________

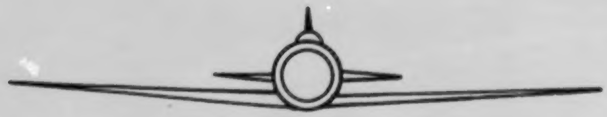
c ____________________

d ____________________

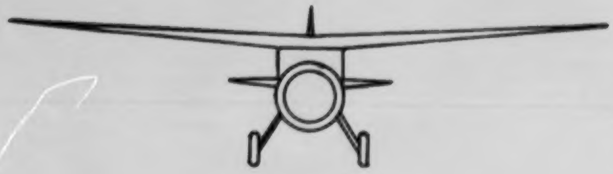
e ____________________

311 Five types of wing design are shown in parts a through e. On the line at the left of each diagram, identify the wing design. [5]

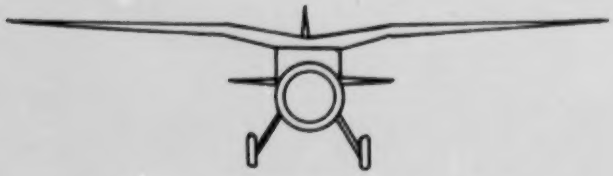
______________________________ a



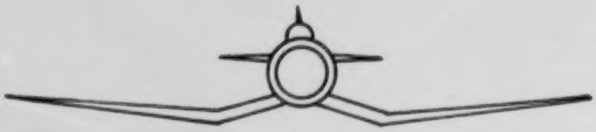
______________________________ b



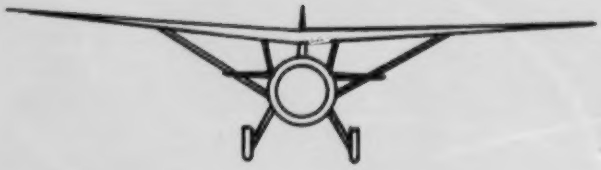
______________________________ c



______________________________ d



______________________________ e



312 On the line at the left of each of the aircraft devices listed in parts a through e, write the number of the function, chosen from the list below, that each device is designed for. [5]

Functions

(1) Aids in engine cooling
(2) Increases engine performance at high altitudes
(3) Stabilizes an aircraft at high speeds
(4) Increases engine performance for emergency situations
(5) Provides additional thrust for jet aircraft
(6) Serves the same function as a carburetor
(7) Prevents stalling at slow speeds

_____ a Water-injection system

_____ b Fuel-injection system

_____ c Supercharger

_____ d Afterburner

_____ e Fins

313 On the line at the left of each of the historical figures in aviation listed in parts a through e, write the number of the invention or achievement, chosen from the list below, which is associated with that person. [5]

Inventions or Achievements

(1) First airplane flight across the English Channel
(2) First to fly across the Atlantic Ocean
(3) First to construct efficient fixed-winged gliders
(4) Developed the fixed-wing principle for flight
(5) First manned lighter-than-air flight
(6) First heavier-than-air powered flight
(7) First powered balloon flight

_____ a Montgolfier Brothers

_____ b Otto Lilienthal

_____ c Sir George Cayley

_____ d Wright Brothers

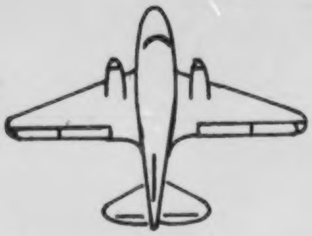
_____ e Louis Blériot

314 On the line at the left of each diagram of a type of wing planform labeled a through e, write the number of the planform type, chosen from the list below, that is shown in that diagram. [5]

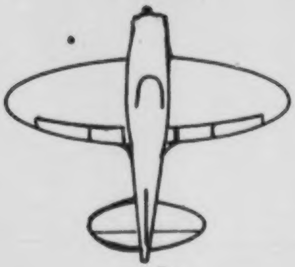
Types of Wing Planforms

(1) Rectangular
(2) Single-tapered
(3) Elliptical
(4) Double untapered
(5) Double-tapered
(6) Tapered trailing edge
(7) Tapered leading edge

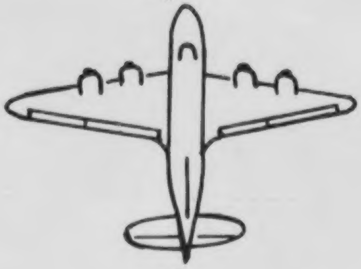
_____ a



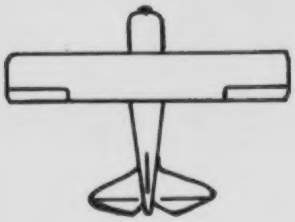
_____ b



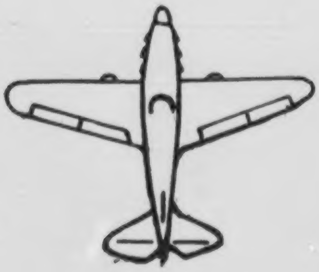
_____ c



_____ d



_____ e



315 List five aircraft instruments which are used for navigation. [5]

a ______________________________

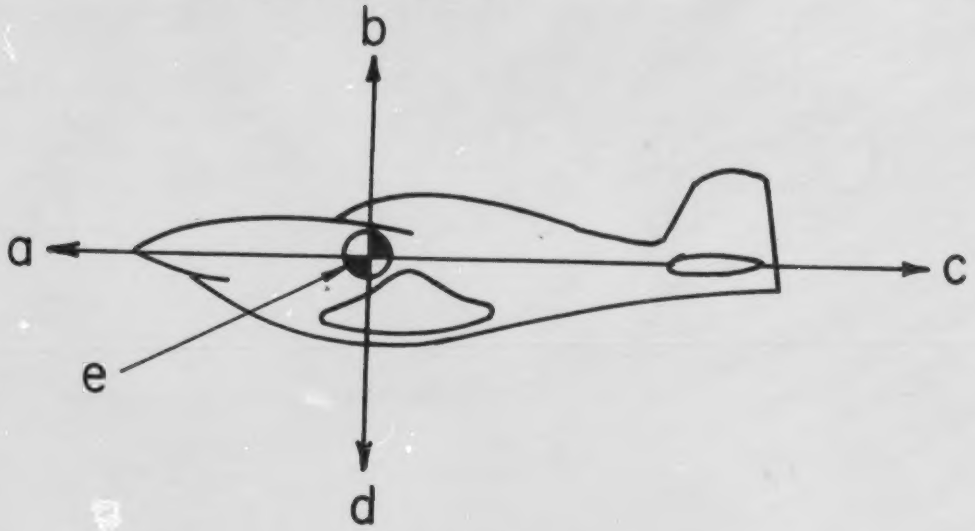
b ______________________________

c ______________________________

d ______________________________

e ______________________________

316 For each of the forces represented by a through e in the diagram of an airplane below, write in the space provided the name of the force indicated by that letter. [5]



a ______________________________

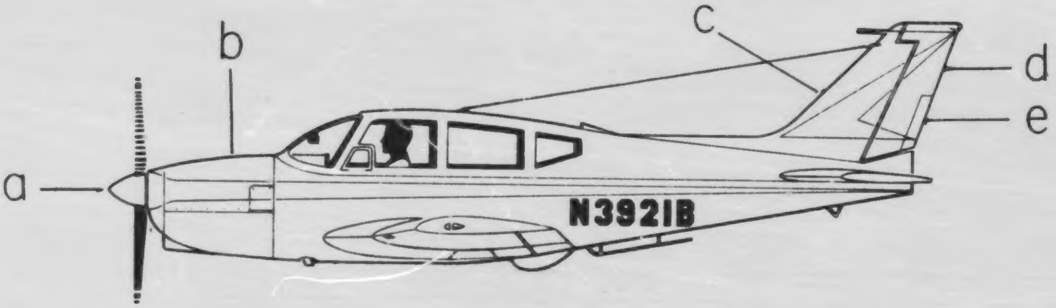
b ______________________________

c ______________________________

d ______________________________

e ______________________________

317 For each of parts a through e in the diagram below, write in the space provided the name of the airplane part that is indicated by that letter. [5]



a ____________________

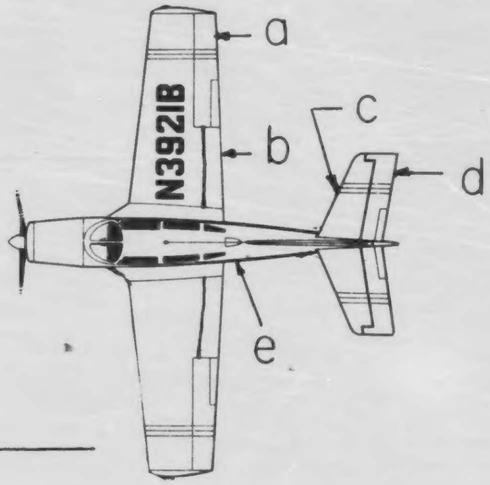
b ____________________

c ____________________

d ____________________

e ____________________

318 For each of parts a through e in the diagram below, write in the space provided the name of the airplane part that is indicated by that letter. [5]



a ____________________

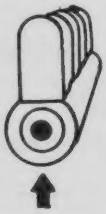
b ____________________

c ____________________

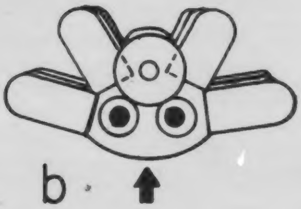
d ____________________

e ____________________

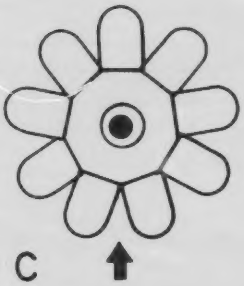
319 Five types of engine configurations are shown in parts a through e. On the line at the left of each diagram, identify the type of engine configuration. [5]



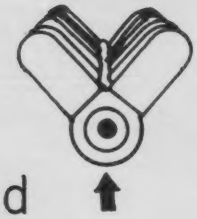
________________ a



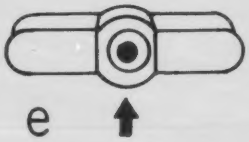
________________ b



________________ c



________________ d



________________ e

Industrial Arts Examination Materials

POWER TECHNOLOGY

Scoring Key

Multiple - Choice Questions

(1)	2	(31)	2	(61)	2	(91)	3	(121)	4
(2)	3	(32)	4	(62)	3	(92)	3	(122)	2
(3)	4	(33)	4	(63)	2	(93)	3	(123)	3
(4)	1	(34)	2	(64)	2	(94)	3	(124)	2
(5)	1	(35)	3	(65)	2	(95)	4	(125)	4
(6)	3	(36)	2	(66)	3	(96)	2	(126)	1
(7)	3	(37)	4	(67)	4	(97)	2	(127)	2
(8)	3	(38)	3	(68)	1	(98)	1	(128)	2
(9)	3	(39)	1	(69)	3	(99)	3	(129)	4
(10)	3	(40)	1	(70)	4	(100)	2	(130)	3
(11)	2	(41)	3	(71)	2	(101)	2	(131)	2
(12)	3	(42)	3	(72)	1	(102)	1	(132)	4
(13)	3	(43)	2	(73)	3	(103)	4	(133)	3
(14)	2	(44)	2	(74)	2	(104)	2	(134)	4
(15)	1	(45)	1	(75)	1	(105)	1	(135)	4
(16)	1	(46)	4	(76)	4	(106)	1	(136)	3
(17)	2	(47)	1	(77)	3	(107)	1	(137)	2
(18)	3	(48)	1	(78)	3	(108)	3	(138)	4
(19)	1	(49)	3	(79)	2	(109)	2	(139)	3
(20)	3	(50)	1	(80)	2	(110)	2	(140)	3
(21)	2	(51)	2	(81)	1	(111)	4	(141)	4
(22)	1	(52)	3	(82)	2	(112)	3	(142)	3
(23)	3	(53)	4	(83)	1	(113)	1	(143)	3
(24)	4	(54)	4	(84)	2	(114)	4	(144)	4
(25)	3	(55)	1	(85)	4	(115)	4	(145)	3
(26)	3	(56)	3	(86)	4	(116)	2	(146)	2
(27)	1	(57)	2	(87)	3	(117)	2	(147)	3
(28)	4	(58)	1	(88)	2	(118)	1	(148)	1
(29)	3	(59)	4	(89)	3	(119)	2	(149)	2
(30)	1	(60)	1	(90)	2	(120)	2	(150)	1

(151)	1	(181)	4	(211)	4	(241)	1	(271)	2
(152)	2	(182)	2	(212)	1	(242)	1	(272)	4
(153)	4	(183)	2	(213)	4	(243)	2	(273)	3
(154)	3	(184)	2	(214)	2	(244)	1	(274)	4
(155)	1	(185)	2	(215)	3	(245)	2	(275)	1
(156)	3	(186)	2	(216)	1	(246)	3	(276)	1
(157)	4	(187)	4	(217)	1	(247)	1	(277)	3
(158)	3	(188)	3	(218)	1	(248)	1	(278)	3
(159)	2	(189)	4	(219)	4	(249)	1	(279)	1
(160)	1	(190)	3	(220)	4	(250)	4	(280)	2
(161)	3	(191)	3	(221)	1	(251)	3	(281)	3
(162)	2	(192)	1	(222)	3	(252)	1	(282)	4
(163)	1	(193)	1	(223)	1	(253)	2	(283)	1
(164)	3	(194)	3	(224)	1	(254)	1	(284)	4
(165)	2	(195)	3	(225)	2	(255)	4	(285)	2
(166)	1	(196)	4	(226)	1	(256)	2	(286)	3
(167)	4	(197)	1	(227)	3	(257)	4	(287)	2
(168)	1	(198)	2	(228)	3	(258)	2	(288)	2
(169)	1	(199)	1	(229)	3	(259)	2	(289)	1
(170)	2	(200)	1	(230)	1	(260)	1	(290)	3
(171)	4	(201)	1	(231)	2	(261)	4		
(172)	1	(202)	2	(232)	3	(262)	1		
(173)	4	(203)	3	(233)	3	(263)	4		
(174)	3	(204)	1	(234)	3	(264)	1		
(175)	3	(205)	3	(235)	4	(265)	1		
(176)	2	(206)	4	(236)	2	(266)	2		
(177)	2	(207)	2	(237)	3	(267)	3		
(178)	3	(208)	2	(238)	3	(268)	3		
(179)	2	(209)	4	(239)	1	(269)	1		
(180)	1	(210)	1	(240)	4	(270)	3		

Group Questions

(291)
a 6
b 7
c 2
d 3
e 4

(292)
a Steel-clad asbestos
b Composition
c Embossed steel
d Steel plate
e Load cell

(293)
a Force
b Radius
c Torque
d Force or Radius
e Radius or Force

(294)
a Spark plug
b Exhaust port
c Intake port
d Transfer passage
e Carburetor

(295)
a 7
b 6
c 5
d 1
e 3

(296)
a 269°
b 274°
c 77°

(297)
a 6.2832 cu. in.
b 7.2832 to 1

(298) Allow any order:
Working under car without safety stands
Oxyacetylene tanks not secured to truck
Oil and debris on floor
Using solvents near welding torch
Improper device for lifting car
No fire extinguisher handy
Solvent not in safety can

(299) Allow any order:
Reservoir
Tubing-Pipes-Hoses
Pump
Valves
Motor or Cylinders

(300) Allow any order:
Produce linear or rotary motion without gears or rods
Self-lubricating
Motion can be transmitted without slack or lost motion
Liquids do not wear or break as do mechanical parts
Applied force can be multiplied and transmitted for considerable distances with little loss of force

(301) Allow any order:
Heat range
Thread size
Reach
Spark gap
Electrode design

(302) Allow any order:
Fuel tank - storage of fuel
Fuel line - transports fuel to engine
Fuel pump - causes transfer of fuel from tank to carburetor
Intake manifold - carries air-fuel mixture to cylinder heads
Carburetor - mixes vaporized fuel with air

(303) Allow any order:
Excess oil in mix
Too cold heat range
Dirty breaker points
Too rich carburetor mixture
Excessive idling

(304) Allow any order:
Defective spark plug
Defective spark plug wire
Defective distributor rotor
Incorrect breaker-point gap
Low grade of fuel
Moisture on wires, cap, or plug

(305) Allow any order:
Heat-resisting valves and valve-seat inserts
Greater clearance for pistons and rings
Larger capacity water pump
Larger capacity radiator
Stronger and heavier bearing material
Larger capacity oil pan
Heavier flywheel

(306) Allow any order:
Reduce heat generated by friction
Seals to prevent leakage between parts
Washing away worn metal particles
Conserve power that would otherwise be wasted
Overcoming excess friction
Carry away heat

(307) Allow any order:
Float level too high
Fuel pump pressure too high
Needle valve stuck open
Sunken float
Defective gaskets in carburetor
Cracked carburetor body

(308) Allow any order:
Incorrect carburetor adjustment
Ignition timing errors
Ignition defects
Improper valve action
Restricted exhaust system

(309) a Fuel inlet
b Igniter
c Air intake
d Combustion chamber
e Exhaust nozzle

(310) a Leading edge
b Upper surface
c Trailing edge
d Chord line
e Lower surface

(311) a Low wing
b High wing
c Gull wing
d Inverted gull wing
e Parasol wing

(312) a 4
b 6
c 2
d 5
e 1

(313) a 5
b 3
c 4
d 6
e 1

(314) a 7
b 3
c 5
d 1
e 6

(315) Allow any order:
Compass (magnetic)
Automatic direction finder
Artificial horizon
Altimeter
Air-speed indicator
Turn and bank indicator
Clock
Vertical speed indicator

(316) a Thrust
b Lift
c Drag
d Gravity or weight
e Center of gravity

(317) a Spinner
b Cowl
c Fin or vertical stabilizer
d Rudder
e Trim tab

(318) a Aileron
b Flap
c Horizontal stabilizer
d Elevator
e Fuselage

(319) a In-line type
b Double-V or fan type
c Radial type
d V-type
e Opposed or flat type

Industrial Arts Examination Materials

PRODUCTION TECHNOLOGY

Directions (1-290): On your answer paper write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Construction

Unit A Developmental Planning (1-20)

1 When an industrial building site is selected, the availability of transportation, labor, and adequate utilities is determined by a

1 feasibility study	3 survey
2 public hearing	4 structural analysis

2 The population density in the area of a prospective construction site is determined by a

1 preliminary study	3 structural analysis
2 site plan	4 working drawing

3 In what type zoning area could a shopping center be built?

1 manufacturing	3 commercial
2 residential	4 agricultural

4 The regulations which restrict the use of certain land for residential building only are called

1 building codes	3 building permits
2 zoning laws	4 site plans

5 The purpose of inspecting construction work is to

1 help finish the job sooner
2 protect the builder
3 insure proper workmanship
4 cut building costs

6 Which groups collaboratively develop building codes and standards?

1 government agencies, architects, and builders
2 architects, lending institutions, and material manufacturers
3 material manufacturers, contractors, and consumer groups
4 government agencies, material manufacturers, and lending institutions

7 Which three utilities and/or services are most desirable on a prospective house site?

1 electricity, sewage disposal, mail delivery
2 electricity, gas, fuel oil
3 gas, special delivery, heat
4 electricity, gas, water

8 Which laws determine what kind of building can be placed on a site and how it can be used?

1 financing laws 3 utility laws
2 tax laws 4 zoning laws

9 Which structure could be built on a 100' × 100' lot located in a zoned residential area?

1 a factory 3 a department store
2 an appliance repair store 4 a single-family home

10 A feasibility study is an investigation into the

1 practices of a builder
2 cost of a project
3 environmental impact of a building on a certain site
4 desirability of locating a structure on a certain site

11 What is a management function performed by an engineer and his staff when designing a bridge?

1 postprocessing 3 organizing
2 planning 4 controlling

12 The modular construction industry is able to build homes cheaper than most home construction companies because they

1 use assembly-line methods
2 use cheaper and lighter materials
3 build homes near the source of the building materials
4 construct a greater variety of styles of homes

13 It is the responsibility of the electric utility company to install and maintain the

1 branch circuits within the structure
2 service drop from the transformer
3 power distribution panel
4 light fixtures within the structure

14 Monuments or benchmarks are used by surveyors to

1 hold a transit in place
2 provide a permanent starting point
3 determine water levels
4 show the boundaries of excavations

15 Which would provide the most useful source of information to specify open areas of land when planning a suburban development?

1 aerial photographs
2 hydrographic survey
3 topographic maps
4 a surveyor's map

16 Grid maps and contour plans are most useful in determining

1 population density
2 soil characteristics
3 construction details
4 elevations

17 An architect would decide on the design of a building foundation after examining

1 a soil testing report
2 a hydrographic report
3 a topographic plan
4 an aerial photograph

18 A plate bearing test is valuable to determine

1 the size of beams to use
2 the degree of soil settlement and stability
3 shear strength of soil
4 water content

19 To calculate elevation, a surveyor would use an instrument called a

1 transit
2 level
3 sextant
4 chronometer

20 An ecological consideration in community development is the impact of construction and land use on

1 tax rates
2 nature trails
3 water tables
4 airborne pollutants

Unit B Real Estate (21-31)

21 The tax assessed on real estate to provide revenue for public services is called

1	a property tax	3	a mortgage tax
2	an income tax	4	a sales tax

22 The agent engaged or contracted to sell property for an owner is called a

1	buyer	3	real estate broker
2	registrar	4	surveyor

23 The legal document which proves ownership of real estate is called

1	an easement	3	a mortgage
2	a deed	4	a survey

24 Home construction projects frequently are financed by bank loans called

1	appraisals	3	titles
2	deeds	4	mortgages

25 Which person is best qualified to determine the true value of a site for commercial construction?

1	real estate broker	3	mortgage officer
2	real estate appraiser	4	county clerk

26 The written agreement to buy a lot is called a

1	purchase offer	3	title
2	deed	4	mortgage

27 What is the financial term for any valuable personal property?

1	a liability	3	an asset
2	a mortgage	4	a title

28 The interest on money borrowed for construction could be considered as

1	taxes on construction	3	rent on borrowed money
2	a mortgage on the house	4	a downpayment

29 The formal meeting that takes place when the buyer of a property gives money to the seller is called a

1 survey
2 registration
3 closing
4 description

30 What is the name of the fees charged for recording the mortgage and deed to a property, for title insurance, and for the services of a notary public?

1 closing costs
2 initial costs of the property
3 real estate agent's fees
4 search for the deed

31 Which type insurance will pay for the balance of a mortgage in the event of the death of the wage earner?

1 liability insurance
2 fire insurance
3 personal property insurance
4 mortgage insurance

Unit C Commercial Construction (32-41)

32 The exterior load-bearing walls of a warehouse most likely would be enclosed with

1 masonry blocks
2 wood paneling
3 plate glass
4 marble slabs

33 Curtain wall is a construction method used to enclose the exteriors of

1 wood-framed dwellings
2 framed superstructures
3 load-bearing superstructures
4 mass superstructures

34 An area of a plumbing system that requires frequent disassembly for repairs would be connected with

1 couplings
2 tees
3 unions
4 ells

35 Steel is imbedded in concrete in order to

1 strengthen the concrete
2 improve the appearance of the concrete
3 provide holes for ventilation
4 increase the weight of the concrete

36 What roofing material is required to cover flat roofs?

(1) wood shingles
(2) building felt
(3) 3-tab asphalt shingles
(4) shakes

37 What should be between a brick veneer and the sheathing on a brick-veneer wall?

1 insulation
2 mortar
3 building paper
4 concrete

38 The materials used to make concrete are

1 fine aggregate, mortar, and sand
2 water, cement, and steel reinforcement
3 coarse and fine aggregate, steel reinforcement, and water
4 coarse and fine aggregate, cement, and water

39 A terrazzo floor is often installed in public buildings because it is

1 extremely durable
2 inexpensive
3 skid proof
4 easy to install

40 A sidewalk is to be poured of solid concrete. The sidewalk is to be 42 feet long, 3 feet wide, and 6 inches thick. How much concrete should be ordered?

(1) $2\frac{1}{3}$ cubic yards
(2) 6 cubic yards
(3) $12\frac{1}{2}$ cubic yards
(4) 14 cubic yards

41 During the month of June, what should be done to protect sidewalk concrete while it is curing?

1 Give it a smooth trowel finish before it is floated.
2 Provide heat so that the concrete dries quickly.
3 Cover it with wet burlap, straw, or a sealing membrane.
4 Remove the forms so that the air can circulate around the concrete.

Unit D Monumental Construction (42-51)

42 The building material most commonly used to construct a football stadium is

1 reinforced concrete
2 structural steel
3 wood frame
4 quarried stone

43 The written details listing the exact standards and materials needed to build a construction project are called

1 site plans
2 floor plans
3 elevations
4 specifications

44 Breakwaters are made of mass construction material called

1 sand
2 earth
3 steel
4 quarried rock

45 Which are superstructures of a bridge construction?

1 pilings
2 abutments
3 piers
4 suspension spans

46 The temporary retaining wall built to divert water at a dam site is called

1 a spillway
2 a cofferdam
3 an abutment
4 a dike

47 What is the most common flooring used in heavy traffic areas of public buildings?

1 carpeting
2 hardwood floors
3 resilient floors
4 terrazzo floors

48 Concrete beams which contain stretched cables are called

1 reinforced
2 precast
3 prestressed
4 trussed

49 The people who assemble the structural steel for skyscrapers are called

1 carpenters
2 plumbers
3 mechanics
4 ironworkers

50 Before a structural steel frame is fastened rigidly, the vertical columns of the structure must be

1	rustproofed	3	plumbed
2	leveled	4	welded

51 Why are there ridges on the surface of steel reinforcement bars?

1 to allow the bars to bend more easily
2 to provide a rough surface so that two rods can be tied together
3 to prevent the bars from being pulled loose after the concrete hardens
4 to act as guides for cutting the steel bars

Unit E Home Construction (52-65)

52 Manufactured housing units which are fitted with wiring, plumbing, and interior walls are known as

1	precut	3	precast
2	prefab	4	modular

53 What is the most common building structure used for house construction?

1	structural steel	3	masonry block
2	wood frame	4	precast concrete

54 Manufactured wall panels with the siding and millwork already installed are called

1	precut	3	modular
2	prefab	4	unitized

55 The construction method of cutting framing studs, joists, and rafters to size in a factory for rapid assembly at the job site is called

1	precut	3	modular
2	prefab	4	unitized

56 Which device lowers the electrical voltage in a powerline to a suitable level for home use?

1	transformer	3	fuse box
2	electric meter	4	circuit breaker

57 Which job should be completed before covering the inside walls and ceilings of a house?

1 trimming	3 painting
2 floor work	4 insulating

58 After gypsum board has been nailed to the studs, the next step when finishing a wall would be to

1 apply plaster
2 place metal lath over the wall
3 fill and tape the joints.
4 paint the wall

59 In plumbing supply systems, copper tubing is usually fastened together by

1 using threaded fittings
2 sweat soldering
3 forcing molten lead into the pipe joint
4 using solvent cement

60 Studs for the walls of a house are located in the ratio of

1 one stud for every square foot of floor space
2 one stud for every lineal foot of wall length
3 two studs for every square foot of wall space
4 two studs for every lineal yard of wall length

61 Which dimensions are most commonly used in the construction of stairs?

(1) 12-inch run, 10-inch rise
(2) 10-inch run, 7-inch rise
(3) 6-inch run, 6-inch rise
(4) 7-inch run, 9-inch rise

62 What must go into a wall cavity before the interior frame of the wall can be covered?

1 insulation, electrical wiring, plumbing, and heating ducts
2 plumbing, heating ducts, trim, and electrical wiring
3 insulation, sheathing, and trim
4 insulation, sheathing, and electrical wiring

63 The rafters of a house are made from 2-inch × 6-inch material. What should be the width of the ridge board?

(1) less than 4 in wide	(3) 6 in wide
(2) 4 in wide	(4) greater than 6 in wide

64 The grade for a building excavation is determined by the

1 top of the batter boards
2 bottom of the batter boards
3 depth of excavation
4 total area of the excavation

65 In plumbing waste systems, plastic pipe is generally fastened together by

1 using threaded fittings
2 sweat soldering
3 using solvent cement
4 forcing molten lead into the pipe joint

Unit F Design (66-85)

66 Siding materials which do not require finishing are applied with

1 common nails
2 box nails
3 noncorrosive fasteners
4 nonconducting fasteners

67 Which one of the following common grades of softwoods is the best grade?

1 No. 1 common
2 utility grade
3 No. 5 common
4 No. 4 common

68 Why are the exposed joints between bricks tooled or pointed?

1 to keep the bricks from cracking
2 to help align the course of the bricks
3 to improve the water seal between the bricks
4 to make the surface rougher

69 Where should the hot water faucet be located in a sink?

1 to the user's right, only
2 to the user's left, only
3 either to the left or right, depending upon the type of sink
4 on the side nearest to the hot water heater

70 What material is most commonly used to bond bricks together?

1 mortar
2 white glue
3 metal fasteners
4 concrete

71 Which test is used to determine the size footing needed for a house?

1 a seepage test
2 a feasibility test
3 a soil compaction test
4 a soil analysis

72 What type of view is sketched by an architect in order to give workmen a general picture of the structural system for a building?

1 a plan
2 an elevation
3 a sectional view
4 a perspective view of the exterior

73 The process of tapping a water main means to

1 bend the water main around a corner
2 increase the diameter of a water main
3 remove rust from inside a water main
4 bore a hole for a small pipe in the water main

74 A contractor uses the material specifications of a job to determine

1 what type of architect to hire
2 how large an excavation to dig
3 how much to bid on a job
4 how long it will take to complete a job

75 What are the basic materials used to construct framed superstructures?

1 steel, tin, and plastic
2 brick, stone, and masonry
3 earth, steel, and cement
4 wood, reinforced concrete, and steel

76 A vent pipe that extends through a roof is usually connected to a

1 cold-water line
2 drain line
3 thin-wall conduit
4 hot-water line

77 The working drawing that shows an external view of an outside wall of a building is called

1 an exterior elevation
2 an interior elevation
3 a vertical section
4 a datum level

78 The different finish grades of a site can be determined by

1 a soil analysis
2 an elevation drawing
3 a contour map
4 a grade-limit graph

79 The primary reason for water traps in a plumbing waste system is to

1 keep wastes moving
2 prevent seepage of dangerous sewer gases
3 reduce noise level in the line
4 reduce the speed of the waste flow

80 Electrical branch circuits in a private dwelling are generally specified to be wired with

1 armored cable
2 nonmetallic sheathed cable
3 conduit systems
4 low voltage signal wire

81 In a multistoried steel-structured building, the floor decks will most likely be made of

1 wooden joists covered with wood
2 steel joists covered with metal
3 mortar and cement block
4 reinforced concrete

82 What is the most likely reason why a house in a region of heavy snowfall would have a very steep roof?

1 more efficient use of space
2 lower cost
3 less chance of roof damage
4 less loss of heat

83 The process of removing water vapor from the air in a home is called

1 humidifying
2 dehumidifying
3 vaporizing
4 heating

84 In a set of building plans, the layout and the partition of the interior of the house are shown on the

1 elevations
2 wall section
3 plot plan
4 floor plan

85 A construction designer checks to see if a new type of furnace requires frequent repairs. What financial factors is the designer considering?

1 financing costs
2 the contractor's profit
3 construction costs
4 servicing costs

Unit G Developing Models (86-94)

86 The purpose of a scale-model dam project which simulates water-flow, erosion, and pressure is to study

1 economic problems
2 structural analysis
3 site problems
4 ecological impact

87 Designers often study the complex problems of a planned community on a reduced site development called a

1 working drawing
2 scale model
3 site plan
4 floor plan

88 How should the corners of a building layout be checked to see if the building is square?

1 by using a framing square
2 by using a line level
3 by measuring the diagonals
4 by measuring the length of all four sides

89 Which material would be the easiest to use in constructing a floor-plan model?

(1) ¼ in tempered masonite
(2) ¼ in plywood
(3) ¼ in styrofoam sheets
(4) ¼ in transite sheets

90 When a model is made to scale, it insures that it will

1 show comparative spaces accurately
2 fit over a standard plan
3 look better
4 be easier to construct

91 Special exteriors like stone or brick are added to architectural models by

1 carefully drawing on the model surface
2 spray painting
3 gluing on small bricks
4 applying printed pattern sheets

92 When the model of a small home uses 1/4-inch-thick wall material, the scale of the model will most likely be

(1) 1" = 1'0" (3) 1/2" = 1'0"
(2) 1/4" = 1'0" (4) 1/8" = 1'0"

93 What type of information is usually obtained from a topographic map of a proposed building site?

1 the names of the previous owners of the building site
2 the types of soil at the building site
3 the location of the proposed structure on the building site
4 the natural features and shape of the land at the building site

94 The process of putting in a lawn by placing sections of rooted grass together is called

1 tilling 3 sodding
2 seeding 4 pruning

Unit H Industry and Careers (95-122)

95 The person in charge of a field office operation at a construction site is the

1 company president 3 field engineer
2 superintendent 4 project clerk

96 Which person installs electrical, plumbing, heating, and air-conditioning systems?

1 the general contractor 3 an architect-consultant
2 a subcontractor 4 an excavating contractor

97 Which person determines the exact location of property boundaries for a construction site?

1 surveyor 3 lawyer
2 realtor 4 engineer

98 A new worker in an on-the-job-training program is called

1 an apprentice 3 an engineering aide
2 a journeyman 4 a management trainee

99 The workers who position reinforcing steel in concrete forms are known as

1 hod carriers
2 rodsetters
3 ironworkers
4 welders

100 Workers recruited from a union hiring hall are selected according to

1 proficiency
2 seniority
3 skill
4 age

101 If union and management are unable to reach an agreement through collective bargaining prior to the expiration of the old contract, the workers will most likely

1 continue working as usual until an agreement is reached
2 accept the terms of management
3 strike
4 boycott the firm's products

102 Which person has the job of accepting the lowest bid and awarding the contract for a construction project?

1 the architect
2 the owner
3 the engineer
4 the contractor

103 Which person is responsible for estimating and bidding on the cost of labor and materials needed to build a construction job?

1 the architect
2 the owner
3 the consulting engineer
4 the contractor

104 Structural steel framework is erected on the job site by workers called

1 ironworkers
2 carpenters
3 masons
4 operating engineers

105 Planning, organizing, and controlling a construction project is the responsibility of the

1 union
2 buyer
3 management
4 government

106 When a person receives an increase in both pay and job responsibilities, he has most likely been

1 fired
2 hired
3 promoted
4 retired

107 The term "laying off" means to

1 fire an employee
2 transfer an employee to a different job
3 demote an employee to a lower paying job
4 release an employee for a temporary period of time

108 The legal document that shows the transfer of property is called a

1 purchase offer
2 mortgage
3 deed
4 building contract

109 Which structure would most likely be built by a private initiator?

1 a missile base
2 a state capitol
3 a school building
4 a restaurant

110 What is the name of the process by which union and management make agreements and contracts?

1 striking
2 collective bargaining
3 price fixing
4 bidding

111 Building trades journeymen learn their special skills in

1 high school
2 college
3 an apprenticeship program
4 an induction program

112 Which three professional groups take part in most real estate sales?

1 realtors, architects, and designers
2 plumbers, electricians, and engineers
3 contractors, subcontractors, and architects
4 realtors, lawyers, and bankers

113 Which person would most likely select the type of exterior wall to be used on a new bank?

1 contractor
2 carpenter
3 foreman
4 architect

114 The union representative who helps a worker discuss grievances with his foreman is the

1 mediator
2 shop steward
3 union griever
4 union welfare aide

115 The workers who operate earthmoving equipment such as draglines, bulldozers, and cranes are called

1 hod carriers
2 ironworkers
3 operating engineers
4 teamsters

116 Which person decides the right-of-way location for a highway building job?

1 a surveyor
2 a contractor
3 an engineer
4 a lawyer

117 A contract dispute between labor and management over an agreement violation can be resolved by a grievance procedure called

1 collective bargaining
2 arbitration
3 conciliation
4 reconciliation

118 Which organization helps workers obtain better wages and working conditions through collective bargaining?

1 labor union
2 contractors' association
3 management association
4 chamber of commerce

119 Which person makes the architectural drawings that are used at the job site?

1 engineer
2 architect
3 draftsman
4 surveyor

120 Which person would plan for the efficient flow of traffic to and from a proposed industrial plant?

1 an architect
2 a mechanical engineer
3 a civil engineer
4 a contractor

121 What group of skilled craftsmen includes plumbers, electricians, bricklayers, and carpenters?

1 production workers
2 managers
3 apprentices
4 office personnel

122 What is the term for the practices related to efficient hiring, training, working, advancing, and retiring people?

1 collective bargaining
2 production technology
3 personnel technology
4 management technology

Part II Manufacturing

Unit A Research and Development (123-146)

123 Listed below are four practices of product development. Which is the correct order in which they should be accomplished?

A Designing
B Engineering
C Researching
D Formulating

(1) A, B, C, D
(2) C, A, B, D
(3) C, B, A, D
(4) D, C, A, B

124 The development of hypotheses, the collection of data, and the drawing of conclusions is known as

1 experimenting
2 engineering
3 researching
4 production

125 Which type of product-design drawing is made first?

1 sketch
2 working drawing
3 presentation rendering
4 assembly drawing

126 Formulating and testing a hypothesis are stages in a process known as

1 the scientific method
2 invention
3 feedback
4 brainstorming

127 The first step of the product-design process is

1 formulation
2 problem statement
3 analysis
4 synthesis

128 Brainstorming is a group method of producing

1 possible solutions to a problem
2 steps in a procedure
3 a finalized plan for a project
4 greater interaction among employees

129 The full-scale working model of a proposed product is known as

1 a sample
2 a mockup
3 an original
4 a prototype

130 Which question would most likely be asked in a market survey?

1 Do you own one now?
2 How much did it cost to manufacture?
3 How many people are needed to make it?
4 Where can it be made?

131 Consumer demand is based on

1 items manufactured
2 advertising
3 needs and wants
4 inputs and outputs

132 The ability of a material to resist being pulled apart is called its

1 wear resistance
2 fatigue resistance
3 compression strength
4 tensile strength

133 The detailed breakdown of production methods and costs to determine manufacturing and selling prices is known as

1 time-and-motion study
2 break-even study
3 cost-estimating study
4 setup-time study

134 Assembly drawings, systems drawings, and detail drawings are commonly thought of as

1 presentation drawings
2 design renderings
3 working drawings
4 production planning

135 Which is a product pilot model?

1 the hard mockup
2 a full-scale prototype
3 a reduced-size model
4 a pasteup model

136 Mohs' scale is used to check

1 weight
2 interest costs
3 hardness
4 elasticity

137 Which might happen if a plant starts production without building a prototype?

1 Costs will be reduced due to faster production time.
2 The company will become well known as the first to produce the product.
3 The company will experience production problems and poor product performance.
4 The company will experience difficulty in acquiring production capital.

138 A researcher is looking for information in technical reports. This type of research is called

1 confidential
2 retrieving
3 descriptive
4 analysis

139 A sales forecast will show

1 available labor
2 the market for the product
3 available raw materials
4 adequacy of production equipment

140 A market-research team has been assigned the task of estimating the saleability of a new, small car. Their consumer survey will be directed to

1 car salesmen
2 environmentalists
3 car owners
4 gas station owners

141 A patent is a

1 method of duplicating product parts
2 method of financing production
3 legal protection for a new invention
4 method of government control of manufacturing

142 Brinnell and Rockwell testers are commonly used in industry to check

1 fatigue resistance
2 metal hardness
3 electron flow
4 galvanic corrosion

143 The making of manufactured goods is called

1 technology
2 processing
3 production
4 automation

144 Which is the most important question to be answered in planning a mass-produced product in a school shop?

1 Would people be interested in buying the product?
2 Can some parts be purchased locally?
3 When are shop classes scheduled?
4 Is equipment available to make the product?

145 A production route sheet is used to

1 locate standard stock
2 schedule delivery of customers' orders
3 show the order of production operations
4 record messages

146 Who developed the assembly-line system for manufacturing automobiles?

1 Eli Whitney 3 Henry Ford
2 Louis Chevrolet 4 Walter Chrysler

Unit B Production Planning (147-166)

147 Which made possible the interchangeable parts required in mass production?

1 jigs 3 machine tools
2 programming 4 mockups

148 The manufacture of a product that is made up of many parts is called

1 interchangeable parts assembly
2 mass production
3 automatic conveyance
4 tooling-up

149 The observation and recording of production processing is called

1 evaluation 3 scheduling
2 routing 4 monitoring

150 Automation in production means

1 mechanized production
2 self-regulating production
3 mass production
4 assembly-line production

151 One automation principle used in manufacturing is

1 input
2 sampling
3 mechanical handling
4 inspection

152 From the list below, select the correct sequence of activities for a product engineering department.

A Build a prototype
B Start production
C Make working drawings
D Set up specifications

(1) C, D, A, B
(2) A, C, D, B
(3) A, B, C, D
(4) D, A, B, C

153 Which type of production is best accomplished by automation?

1 small-quantity production
2 single-item reproduction
3 mass production
4 custom-design production

154 The basic principle of automation is best illustrated by

1 an automotive engine
2 a metal lathe
3 a home thermostat
4 a milling machine

155 What is meant by standardization of parts?

1 All parts are identical and interchangeable.
2 Parts are close in size, but may be different.
3 Parts may be fit and tried by hand.
4 No specific sizes or tolerances are followed.

156 The thermostat that controls the temperature in a room is an example of which principle of automation?

1 output
2 processing
3 feedback
4 mechanical adjustment

157 If a small error or "mistake" in the size of a component can be allowed, the error is shown on a drawing as a

1 work measurement
2 design alternative
3 tolerance
4 template

158 Numerical controls on machine tools help to eliminate

1 slow, tedious jobs
2 operator error
3 machine breakdown
4 tool breakage

159 The term "N/C" means

1 new computer
2 number capacity
3 numerical control
4 nontraditional company

160 Which group of experts would probably attend a product-planning meeting?

1 sales, financing, and servicing
2 engineering, maintenance, and advertising
3 marketing, engineering, and production
4 servicing, designing, and research

161 Automation is used in industry to

1 replace people with machines
2 increase sales
3 operate everything without people
4 increase production and reduce cost

162 The control of machines by other machines is called

1 mechanization
2 remote control
3 automation
4 production control

163 All the work processes in a production department should be timed

1 while building the prototype
2 before designing the product
3 before mass production begins
4 after mass production is finished

164 When a manufacturer tools-up for production, the last step would probably be to

1 get a loan for production costs
2 make a flow chart
3 do a trial run
4 figure the break-even point

165 A manufacturer switches from producing clothes brushes to hair brushes every few weeks. This is known as which type of production?

1 assembly line
2 continuous
3 intermittent
4 interrupted

166 Which one of the following activities is a planning practice?

1 correcting
2 producing
3 monitoring
4 formulating

Unit C Plant Organization (167-188)

167 What are the functions of management in a corporation?

1 planning and organization
2 work and supervision
3 design and production
4 maintenance and production

168 What are the functions of the purchasing department?

1 production control
2 buying supplies and equipment
3 setting prices for products
4 quality control

169 Which department in a plant develops test and inspection procedures for manufacturing?

1 research and development
2 marketing
3 engineering
4 personnel

170 A general labor agreement between union and management usually contains a section pertaining to

1 work experience
2 hours of employment and overtime
3 departmental assignments
4 annual report

171 Which department is responsible for carrying out changes in the shapes and materials of a manufactured product?

1 marketing
2 production
3 finance and control
4 research and development

172 Who is responsible for planning, organizing, directing, and controlling an American corporation?

1 the government
2 the stockholders
3 the management
4 the workers

173 Which of the following categories of employees are white-collar workers?

1 technicians
2 skilled workers
3 semiskilled workers
4 unskilled workers

174 A company is going to make a new product using new machines that are unfamiliar to the regular workers. What will the company most likely do?

1 Fire some of the workers and hire new ones who can run the machines.
2 Start a training program for the workers to use the new machines.
3 Change the design to be able to use the existing equipment.
4 Buy only machines that the workers can operate.

175 A new employee reports to his supervisor in a production area. The supervisor shows the new man how to run a machine and watches him closely for the first week. This is an example of

1 apprenticeship training
2 on-the-job training
3 vestibule school training
4 cooperative training

176 Which is trained as a work-measurement specialist?

1 computer analyst
2 time-study analyst
3 industrial engineer
4 production coordinator

177 Select the correct order for settling labor-management disputes from the steps listed below.

A Management counterproposal
B Mediation
C Union proposal
D Negotiations

(1) C, A, D, B
(2) D, C, B, A
(3) B, C, A, D
(4) C, D, A, B

178 Which best describes the computer job title of "programmer"?

1 repair and maintain computers
2 write instructions for computers
3 install and operate computers
4 collect raw data for analysis

179 Which statement is true of industrial and manufacturing engineers?

1 They plan ways to manufacture a product.
2 They design and develop the product.
3 They do product postprocessing.
4 They control product financing.

180 Which workers are employed at an organizational level between engineers and craftsmen?

1 unskilled workers
2 semiskilled workers
3 skilled workers
4 technicians

181 Which type of worker requires no special training and is often involved in handling and moving materials?

1 unskilled workers
2 semiskilled workers
3 skilled workers
4 technicians

182 An individual who settles disputes between workers and management is

1 a stockholder
2 a director
3 a shop steward
4 an arbitrator

183 Policy decisions for a corporation are made by the

1 stockholders
2 directors
3 customers
4 personnel administrators

184 From whom can a manufacturer get help if he needs to increase production?

1 a mechanical engineer who can design better products
2 an industrial engineer who directs the study of time and motion
3 a skilled craftsman who can "troubleshoot" the production line
4 a production foreman who is concerned with meeting production schedules

185 Which classification of workers has excelled in its particular trade and may also have planning know-how?

1 managers
2 technicians
3 semiskilled workers
4 skilled workers

186 The most important quality for a plant manager to possess is

1 skill in a craft
2 ability to delegate authority
3 an impersonal attitude
4 sympathy for workers' problems

187 Which describes the separation of jobs into individual operations?

1 specialization of labor
2 quantity production
3 hand processing
4 individual production

188 Technicians usually have

1 advanced graduate degrees
2 one or two years of education beyond high school
3 a college degree
4 a high school diploma, only

Unit D Line Production (189-218)

189 Which type of chart would show the order of operations in product manufacturing?

1 a break-even chart
2 a histogram
3 a flow-process chart
4 a marketing chart

190 Receiving, unpacking, handling, and storing materials are practices of

1 processing
2 preprocessing
3 production
4 postprocessing

191 A sack of potatoes bought in a store has been refined by

1 filtering
2 floating
3 peeling
4 weighing

192 Which is an example of standard stock?

1 a door handle
2 a sheet of aluminum
3 a pile of coal
4 a sack of nails

193 Standard parts are made from standard stock by

1 mixing and mechanical fastening
2 forming and separating
3 etching and cutting
4 sanding and buffing

194 The process of taking away some material in order to change its form is known as

1 forging
2 separating
3 forming
4 removal

195 Bending and drawing are forming operations of

1 casting and molding
2 compressing and stretching
3 conditioning and separating
4 bonding and coating

196 An example of a chip-removal process is

1 slicing a tomato
2 sanding a board
3 cutting a paper pattern
4 etching metal

197 An example of a thermal-erosion process is

1 flame-cutting
2 etching
3 hot-rolling
4 shearing

198 Small bits of material are lost along the parting line during the process of

1 shearing
2 chip removal
3 fracturing
4 stretching

199 One of the stages in production is

1 combining
2 marketing
3 researching
4 maintaining

200 Paste and glue are often used for

1 fusion bonding
2 conversion coating
3 chemical additives
4 adhesive bonding

201 The process of induced-fracture separation is shown in

1 heliarc welding
2 glass cutting
3 thermal erosion
4 electrochemical machining

202 Which method is normally used for automobile assembly?

1 batch or small-lot assembly
2 continuous-assembly line
3 custom-fit hand assembly
4 minimum-production assembly

203 Which processes are used in making a simple wooden pencil without an eraser attachment?

1 combining, only
2 forming, separating, and combining
3 separating and combining, only
4 forming and combining, only

204 Drilling is a process of

1 forming
2 chip removal
3 compression
4 abrasion

205 Casting is a type of

1 forging
2 thermal interaction
3 forming
4 molding

206 Plastic parts are normally assembled by

1 brazing
2 spot welding
3 adhesive bonding
4 induced fracturing

207 A metal automobile fender is made by a process of

1 conditioning
2 stretching
3 casting
4 molding

208 Which can be classified as a conditioning process?

1 casting
2 stretching
3 compressing
4 annealing

209 A finished product, such as a record changer, is classified as

1 a component
2 a subassembly
3 a part
4 an assembly

210 Vacuum forming, blowing, and stretch forming are all techniques of which process?

1 rolling
2 drawing
3 conditioning
4 forging

211 Sand casting is considered a one-shot molding process because

1 the product is made in one casting
2 the mold is used only once
3 one mold can be used for many castings
4 the mold has only one opening

212 Which is the strongest mechanical fastener for wood products?

1 corrugated fasteners
2 casein glue
3 resorcinol
4 screws

213 Two basic purposes of shearing are to

1 divide material and give it shape
2 crumble and shred material
3 increase the amount and the strength of the material
4 make the material flat and smooth

214 Threaded fasteners hold components together by

1 adhesion
2 fusion
3 cohesion
4 friction

215 Which is a permanent, mechanical fastener?

1 rivet
2 hinge
3 nut and bolt
4 cotter pin

216 If some parts of a product must be taken apart and put together frequently, they should be held together by

1 fusion bonding
2 mechanical fastening
3 conversion coating
4 adhesive bonding

217 The inspection of products during manufacture is called

1 research and development
2 quality control
3 supervision
4 time-and-motion study

218 A light bulb in a lamp is considered a subassembly. As a finished product from the factory, it would be considered

1 an assembly
2 a component
3 a part
4 durable goods

Unit E Production Processes (219-248)

219 What are the two main categories of manufactured products?

1 synthetic and nonsynthetic goods
2 finished and unfinished goods
3 durable and nondurable goods
4 goods and products

220 Unpasteurized milk, fresh fish, and iron ore are classified as

1 standard stock
2 raw materials
3 production sources
4 finished products

221 A ductile material is one that can be forced into a different shape by

1 casting
2 stretching or pulling
3 shearing
4 exploding

222 Compared to a part to be cut, a cutting tool must be

1 larger
2 smaller
3 harder
4 softer

223 Two ways of making one-shot moldings are

1 transfer molding and slush casting
2 die casting and centrifugal casting
3 on-site pouring and injection molding
4 investment and sand casting

224 Which is an induced-fracture separator?

1 laser
2 lathe
3 milling machine
4 glasscutter

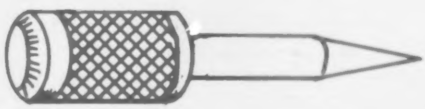
225 For maximum economical production, parts should be specified

1 with limits of acceptable measurement for interchangeability
2 with exact measurements as a criterion for quality
3 by a craftsman creating a perfect product
4 in standard English measurements

226 A master gage is used to test a manufactured product for

1 specified size limits
2 classification into size groups
3 structural strength
4 quality of assembly

227 Which machine is best suited for producing the part pictured below?



1 lathe
2 vertical mill
3 grinder
4 shaper

228 The three basic processes in which materials are separated are

1 shearing, chip removal, and "nontraditional"
2 casting, bending, and cutting
3 molding, compressing, and stretching
4 heat, chemical, and electrical

229 Most ceramic wall and floor tiles are produced by the process of

1 jiggering
2 throwing
3 tumbling
4 pressing

230 Which tool locates and holds the work for a cutting tool?

1 gage
2 jig
3 fixture
4 tool bit

231 The device that limits and guides the path of a cutting tool is a

1 gage
2 jig
3 fixture
4 tool bit

232 Which element is found in all ferrous metals?

1 carbon
2 silicon
3 copper
4 iron

233 Ferrous metal alloys can be identified by their

1 magnetic attraction
2 resistance to heat
3 resistance to rusting
4 color

234 In a shearing operation, there will always be

1 a sanding, buffing, or drilling tool
2 electric current, dielectric, and a discharge machine
3 force, a cutting edge, and a workpiece
4 fuel, oxygen, and a flash point

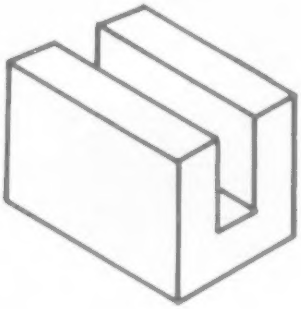
235 Which machine will rapidly produce large quantities of small, turned parts?

1 turret lathe
2 automatic screw machine
3 numerical-control mill
4 numerical-control lathe

236 Plastic bags are sealed by a process of heating and pressing called

1 foiling
2 fusion
3 bonding
4 fastening

237 Which machine is best suited for producing the part pictured in the diagram below?



1 lathe
2 horizontal mill
3 grinder
4 shaper

238 Which substance is a raw material?

1 Plexiglas
2 sheet steel
3 paneling
4 wood

239 A design printed with a rubber-stamp process is an example of

1 screen-process printing
2 intaglio printing
3 planographic printing
4 relief printing

240 Which is the process of putting together all the sheets for a single book in correct order?

1 binding
2 assembling
3 collating
4 trimming

241 In lithographic printing, the printing plates are made by a chemical separating process called

1 thermal erosion
2 etching
3 conversion coating
4 fusion bonding

242 Printing is a production process involving

1 chemical action on inert material
2 combining components by coating
3 mechanical bonding of materials
4 fusing materials through pressure

243 Plastics are classified as either themoplastic or

1 synthetic
2 natural
3 thermoset
4 thermoconductive

244 The latest trend in the production of automobiles is to

1 increase horsepower
2 increase weight
3 use more synthetic materials
4 use more natural materials

245 Most modern cabinet fronts that have a scroll or carved appearance are made of

1 walnut
2 pine
3 plywood
4 plastic

246 A grinder puts a smooth finish on metal by

1 heating the surface till it melts and runs
2 removing many small chips
3 coating the surface through electrolysis
4 peeling off the surface with a single-edged tool

247 Forging is done by what types of force?

1 casting and pouring
2 shearing and chip removal
3 hammering and squeezing
4 mixing and bonding

248 Forming and separating processes are used in making

1 raw materials
2 components
3 assemblies
4 subassemblies

Unit F Financial Control (249-273)

249 What is a possible advantage peculiar to a company organized as a corporation?

1 If the owner dies, the business is continued by the family.
2 Stockholders are not individually liable.
3 The company is unable to declare bankruptcy.
4 The profits are not taxable.

250 Money used for payment of wages and advertising is called

1 profit flowback
2 working capital
3 fixed capital
4 short-term capital

251 What type of document gives inventors exclusive rights to make and sell their inventions?

1 proprietorship
2 ledger
3 subcontract
4 patent

252 An entrepreneur is a

1 president of a stock company
2 private business person
3 controller in a business organization
4 manager of a French-owned company

253 Loans made for 30 days to 1 year are called

1 profit flowback
2 working capital
3 fixed capital
4 short-term capital

254 Which of the following is an example of a capital resource?

1 office furniture
2 savings
3 profits
4 workers

255 What is the distribution method whereby a manufacturer is paid by the store owners only for the items sold?

1 direct selling to consumers
2 direct selling to stores
3 consignment selling
4 franchise outlets

256 Which publication would include the company history, the stock offering, financial statistics, and dividend policy of the company?

1 prospectus
2 annual report
3 marketing report
4 stock dividend

257 The purpose of an annual report is to provide information to the

1 consumers
2 company president
3 board of directors
4 stockholders

258 Which is an example of indirect costs in manufacturing a product?

1 labor
2 materials
3 maintenance
4 transportation

259 Paying employees in relation to the number of items they produce is called

1 hourly rate
2 piece rate
3 cost-of-living raise
4 salary increment

260 Corporations usually obtain funds for startup costs from

1 stock sales
2 government subsidies
3 donations
4 savings

261 A single-proprietorship business organization is controlled by

1 a board of directors
2 the stockholders
3 the workers
4 the owners

262 Those who are responsible for carrying out the policies of corporations are the

1 stockholders
2 board of directors
3 chief executive officers
4 personnel administrators

263 A corporation is controlled by

1 a president
2 a partnership
3 a board of directors
4 the stockholders

264 Failure of a small business is usually caused by

1 poor products
2 lack of hard work
3 poor management
4 bad labor practices

265 The business organization whose profits are taxed as personal income is a

1 single proprietorship
2 corporation
3 joint-stock company
4 business entity

266 A corporation is an "artificial person" that

1 dies when the stockholders die
2 lives for a specified time
3 dies if the officers die
4 continues to live apart from officers and stockholders

267 A common way to start a corporation is by

1 taking orders for the product
2 selling stocks and bonds
3 employee financing
4 government direction

268 Dividends are taken from a corporation's profits and are paid to the

1 employees
2 government
3 stockholders
4 officers

269 Which are examples of a corporation's fixed assets?

1 raw materials and potential sales
2 buildings and land
3 profits and losses
4 finished products ready for sale

270 A company's assets, liabilities, and profit or loss are shown on

1 inventory records
2 a balance sheet
3 the corporation charter
4 a break-even chart

271 Which are two basic types of operating costs?

1 hand and machine
2 wages and salaries
3 supplies and labor
4 fixed and variable

272 Which term refers to styles, trademarks, initials, and symbols?

1 media
2 logo
3 advertising
4 marketing

273 The total money taken in by a company from the sale of its products is known as

1 operating income
2 net sales
3 gross sales
4 net income

Unit G Industrial Organization (274-290)

274 Which department of a company is responsible for the sale of a company's product?

1 production
2 marketing
3 engineering
4 financial

275 A draftsman's job responsibilities include

1 designing a product
2 building a prototype
3 setting up a production line
4 making working drawings

276 Several companies that make the same product will try to outsell each other by offering the best terms to the customer. This business practice is called

1 marketing
2 competition
3 sales technique
4 sales report

277 The gross national product of a nation is the amount of

1 total production of goods and services
2 products it produces in the greatest numbers
3 difference between total export and import costs
4 money it pays for products

278 The business organization in which two or more executives share responsibilities, liability, and profits is known as a

1 single proprietorship
2 partnership
3 corporation
4 high-risk venture

279 The economic system where individuals produce and receive a profit for their products is known as

1 mercantilism
2 socialism
3 capitalism
4 communism

280 Compared with modern American industry, pre-1776 American industry lacked

1 company presidents
2 production systems
3 low-cost transportation
4 standardization

281 Which term best describes the economic system used in the U.S. today?

1 bartering
2 monetary
3 utility
4 trading

282 Which development helped start the Industrial Revolution?

1 discovery of radium
2 custom production
3 Bessemer converter
4 steam engine

283 What is the major factor in determining the price of a manufactured product?

1 volume of sales
2 cost of materials
3 profit
4 availability of labor

284 Which industry is an example of a direct producer-to-consumer sales channel?

1 airline industry
2 pharmaceutical industry
3 automotive industry
4 furniture industry

285 Which of the following American industries first used interchangeable parts in its product?

1	steam-engine industry	3	automotive industry
2	small-arms industry	4	craft-level industry

286 The process of turning all company assets into cash and distributing it to the owners is known as

1	paying dividends	3	bankruptcy
2	stock splitting	4	liquidation

287 Which statement describes the free-enterprise system?

1 business controls and fixes prices
2 government makes and prices goods
3 business competes for price and profit
4 limited choice of goods and little or no profit

288 One of the most important resources a company has is its

1	new buildings	3	advertising
2	employees	4	good location

289 Which group of employees will increase most in the future?

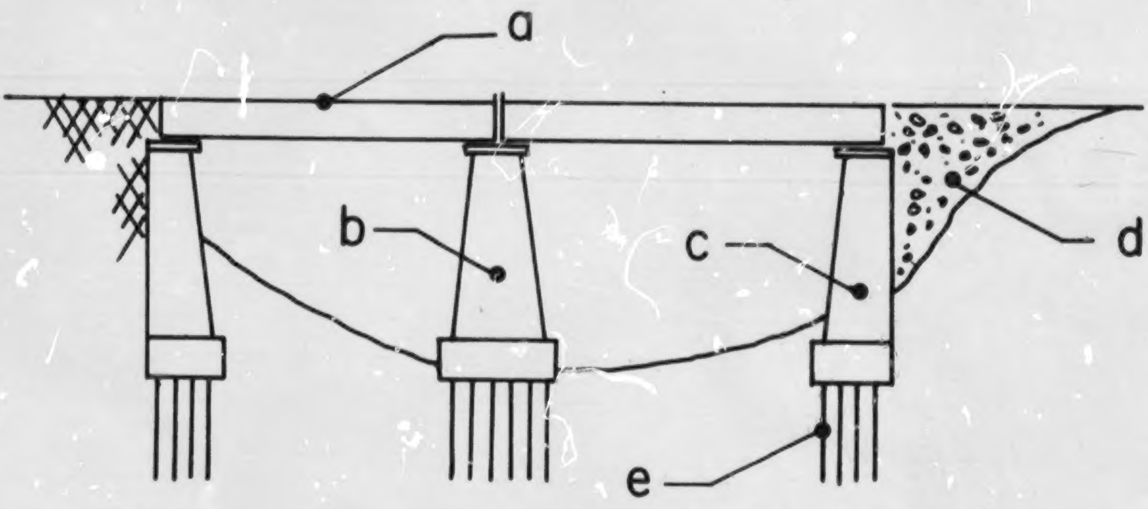
1	unskilled	3	service
2	skilled	4	agricultural

290 Which technologies (knowledge) are used in manufacturing?

1 personnel, machine, and financial
2 production, machine, and organizational
3 management, personnel, and production
4 machine, personnel, and production

Group Questions (291-309)

291 On the line at the left of each of parts a through e, write the number of the bridge section, chosen from the list below, which is indicated by that letter in the diagram below. [5]



Bridge Sections

(1) Pier
(2) Embankment
(3) Steel arch
(4) Piles
(5) Cantilever
(6) Steel span
(7) Abutment

_______ a

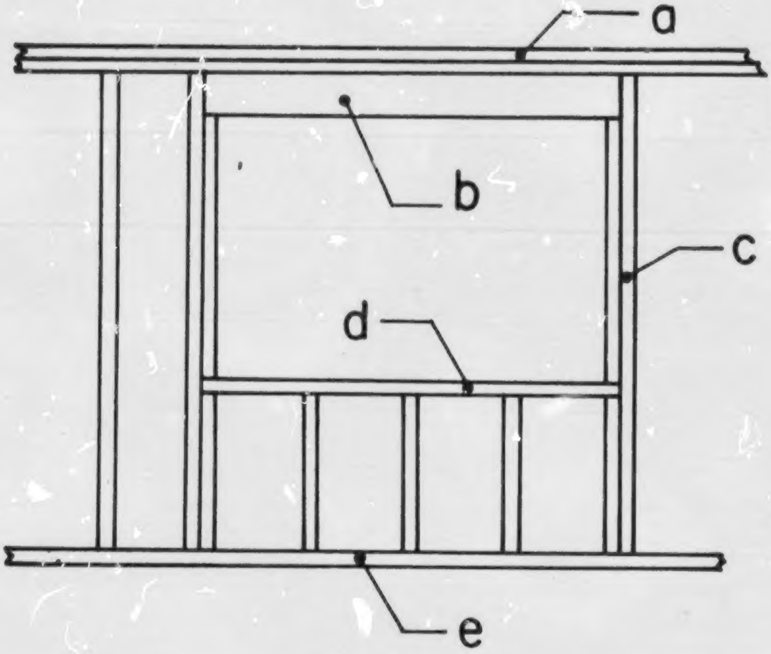
_______ b

_______ c

_______ d

_______ e

292 For each of parts a through e in the diagram of the wall frame shown below, write in the space provided the name of the part of the wall frame indicated by that letter. [5]



a ______________________________

b ______________________________

c ______________________________

d ______________________________

e ______________________________

293 On the line at the left of each job title in parts a through e, write the number of the job duty, chosen from the list below, that would be performed by a person with that job title. [5]

Job Duties

(1) Performs the actual construction of a building
(2) Checks to see if the quality of construction meets certain standards
(3) Makes financial arrangements for constructing a building
(4) Designs a construction project
(5) Coordinates the construction workers
(6) Landscapes a building after it is constructed
(7) A new worker who is learning about the construction trade

______ a Carpenter

______ b Architect

______ c Building inspector

______ d General contractor

______ e Apprentice

294 On the line at the left of each finishing material in parts a through e, write the number of the solvent, chosen from the list below, which is the proper solvent for each finishing material. (A number may be used more than once or not at all.) [5]

Solvents

(1) Alcohol
(2) Water
(3) Turpentine
(4) Lacquer thinner

______ a White shellac

______ b Oil varnish

______ c Gloss lacquer

______ d Orange shellac

______ e Paste wood filler

295 On the line at the left of each job listed in parts a through e, write the number of the type of equipment, chosen from the list below, that is best suited for performing that job. [5]

Equipment

(1) Derrick
(2) Piledriver
(3) Dragline
(4) Compactor
(5) Trencher
(6) Bulldozer
(7) Payloader

______ a Compressing fill

______ b Dredging a canal

______ c Digging a pipeline

______ d Loading a truck

______ e Setting excavation sheathing

296 On the line at the left of each construction job described in parts a through e, write the job title of the worker who would most likely perform that job. [5]

______________________ a Builds concrete-block walls

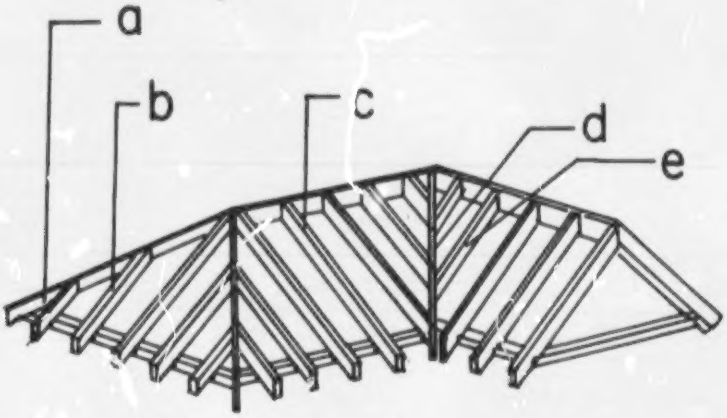
______________________ b Builds forms, shoring, and scaffolding

______________________ c Erects and connects steelwork

______________________ d Installs electrical wiring systems

______________________ e Installs water and sanitary systems

297 On the line at the left of each of parts a through e, write the number of the roof part, chosen from the list below, which is indicated by each letter in the diagram. [5]



Roof Parts

(1) Valley rafter
(2) Hip jack
(3) Stud
(4) Hip rafter
(5) Joist
(6) Valley jack
(7) Common rafter

______ a

______ b

______ c

______ d

______ e

298 On the line at the left of each type of construction information in parts a through e, write the number of the type of blueprint, chosen from the list below, that would provide that information for that area. [5]

Blueprints

(1) Section view
(2) Heating plan
(3) Elevations
(4) Plumbing plan
(5) Plot plan
(6) Floor plan
(7) Electrical plan

______ a The size of the rooms in a building

______ b The material specifications

______ c The external appearance of a building

______ d The location of a building on a lot

______ e The location of light switches

299 On the line at the left of each abrasive description in parts a through e, write the number of the abrasive, chosen from the list below, that is best identified by the description. [5]

Abrasives

(1) Silicon carbide
(2) Pumice stone
(3) Garnet
(4) Emery cloth
(5) Aluminum oxide
(6) Rottenstone
(7) Flint

______ a Natural abrasive, red color, good for woodwork

______ b Natural abrasive, white color, good for softwoods and paint removal

______ c Synthetic abrasive, brown color, lasts a long time, good for all woodwork

______ d Natural abrasive, black color, used for polishing metal

______ e Synthetic abrasive, black color, used in wet-and-dry paper to smooth finishes

300 On the line at the left of each operation description in parts a through e, write the number of the manufacturing operation, chosen from the list below, that best represents the description. [5]

Operations

(1) Casting
(2) Bonding
(3) Assembling
(4) Coating
(5) Chip removal
(6) Refining
(7) Postprocessing

______ a Putting a layer of one kind of material on top of another
______ b Method of joining parts
______ c A forming process
______ d Removing excess stock
______ e Combining subassemblies

301 On the line at the left of each definition of capital in parts a through e, write the number of the type of capital, chosen from the list below, that is best represented by that definition. [5]

Types of Capital

(1) Short-term capital
(2) Intermediate-term capital
(3) Long-term capital
(4) Fixed capital (Assets)
(5) Working capital
(6) Borrowed capital
(7) Equity capital

______ a Put up by the owners of a business
______ b Contains a commitment to repay at future date
______ c Asset used over and over again for extended period of time
______ d Money used for payment of wages, advertising, etc.
______ e Buildings and grounds

302 On the line at the left of each company department in parts a through e, write the number of the department function, chosen from the list below, that best describes the function of each department. [5]

Department Functions

(1) Repairs facilities and equipment
(2) Assembles parts on an assembly line
(3) Oversees production
(4) Controls costs and expenses
(5) Routes transportation
(6) Inspects the product for proper sizes and specifications
(7) Plans a program to distribute a product

______ a Marketing

______ b Production

______ c Maintenance

______ d Quality Control

______ e Finance

303 On the line at the left of each manufacturing question listed in parts a through e, write the number of the department, chosen from the list below, that would most likely be concerned with that question. [5]

Departments

(1) Research and Development
(2) Engineering
(3) Production
(4) Marketing
(5) Quality Control
(6) Finance

______ a Is there a need for the product?

______ b What are the product limitations of size and shape?

______ c What special jigs and fixtures are needed?

______ d How much material, machines, and labor force are needed?

______ e Are all the parts the same?

304 On the line at the left of each manufacturing term listed in a through e, write the number of the description, chosen from the list below, that best represents that term. [5]

Descriptions

(1) To manufacture a product entirely by machine-controlled operation
(2) To produce in volume by use of machinery
(3) Procedure followed when a different product is to be manufactured
(4) When work passes from one work station to the next work station
(5) The breaking-down of a large operation into separate jobs
(6) When a team of workers assemble an entire unit

______ a Mass production

______ b Automation

______ c Assembly-line methods

______ d Specialization of industry

______ e Tooling-up

305 On the line at the left of each job title in parts a through e, write the number of the job description, chosen from the list below, that best represents the duties of that job. [5]

Job Descriptions

(1) Works out the original sketches of a product
(2) Buys stock in a company
(3) Makes the working drawings of a product
(4) Oversees the buying of materials for a product
(5) Controls the funds of a company
(6) Supervises production workers
(7) Fabricates or puts together parts of a product

______ a Designer

______ b Purchasing agent

______ c Assembler

______ d Draftsman

______ e Foreman

306 On the line at the left of each bonding method in parts a through e, write the number of the description, chosen from the list below, that best represents that method. [5]

Descriptions

(1) Heat is generated by resistance
(2) Tool vibrates at 20,000 times per second
(3) Screws and bolts used to hold sections together
(4) Bronze melted by torch
(5) Spinning part results in heat by friction
(6) Mandrel swells shank to hold parts together
(7) Lead and tin alloy are melted together

______ a Soldering

______ b Blind or pop rivets

______ c Spot welding

______ d Mechanical fasteners

______ e Ultrasonic welding

307 On the line at the left of each type of workpiece-holding device listed in parts a through e, write the number of the description, chosen from the list below, that best represents that device. [5]

Descriptions

(1) Used to support and level a workpiece
(2) Slides work into place
(3) Used to hold a tubular workpiece
(4) Used to attach clamps to a drill press table
(5) Used to hold a workpiece
(6) Template providing guide holes

______ a Jack screw

______ b V-block

______ c Drilling fixture

______ d Jig

______ e T-bolt

308 List three kinds of controls that are used when production is done with automated equipment. [3]

(1) ______________________________

(2) ______________________________

(3) ______________________________

309 List the five functions of corporate management. [5]

(1) ______________________________

(2) ______________________________

(3) ______________________________

(4) ______________________________

(5) ______________________________

Industrial Arts Examination Materials

PRODUCTION TECHNOLOGY

Scoring Key

Multiple-Choice Questions

(1)	1
(2)	1
(3)	3
(4)	2
(5)	3
(6)	1
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(11)	2
(12)	1
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(24)	4
(25)	2
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(291)	a	6
	b	1
	c	7
	d	2
	e	4
(292)	a	Top plate
	b	Header
	c	Trimmer stud
	d	Rough sill
	e	Sole
(293)	a	1
	b	4
	c	2
	d	5
	e	7
(294)	a	1
	b	3
	c	4
	d	1
	e	3
(295)	a	4
	b	3
	c	5
	d	7
	e	2
(296)	a	Mason
	b	Carpenter
	c	Ironworker
	d	Electrician
	e	Plumber
(297)	a	4
	b	2
	c	7
	d	1
	e	6
(298)	a	6
	b	1
	c	3
	d	5
	e	7
(299)	a	3
	b	7
	c	5
	d	4
	e	1
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	b	2
	c	1
	d	5
	e	3
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	b	6
	c	5
	d	1
	e	4
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	b	2
	c	1
	d	6
	e	4
(303)	a	4
	b	1
	c	2
	d	3
	e	5
(304)	a	6
	b	1
	c	4
	d	5
	e	3

(305) a 1
b 4
c 7
d 3
e 6

(306) a 7
b 6
c 1
d 3
e 2

(307) a 1
b 3
c 5
d 6
e 4

(308) Allow any order:

Fluidic-Pneumatic-Hydraulic
Electrical-Electronic-Computerized
Mechanical

(309) Allow any order:

Staffing
Planning
Organizing
Directing
Controlling